A.E.S Engineering Ltd. GHG Inventory

Scope 1, 2 & 3 Emissions Inventories

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1 Responsible Undertaking

A.E.S Engineering Ltd. is the parent company and the highest business entity and therefore will be responsible for undertaking the completion of all requirements for the group. This will cover all subsidiary companies worldwide including those within the UK.

- **Company Registration Number:** 00392743
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2 Results

2.1 GHG Protocol

Category	CO_2e (Tonnes)
Scope 1	2,548.83
Scope 2 (Location-based)	2,975.88
Scope 2 (Market-based)	1,643.94
Scope 3	112,422.62
All Scopes (Location-based)	117,947.33
All Scopes (Market-based)	116,615.40

2.2 14064-1

Category	CO_2e (Tonnes)
1. Direct GHG emissions and removals	2,548.8
2. Indirect GHG emissions from imported energy (Location-based)	2,975.9
2. Indirect GHG emissions from imported energy (Market-based)	1,643.9
3. Indirect GHG emissions from transportation	35,213.1
4. Indirect GHG emissions from products used by organisation	76,604.10
5. Indirect GHG emissions associated with the use of products from the organisation	605.5

3 Introduction

3.1 A.E.S Engineering Ltd. & Sustainability

The following document serves as an assessment of the greenhouse gas emissions of A.E.S Engineering Ltd., a UK-based manufacturing company producing mechanical seals, sealing products and seal support products for a global market.

A.E.S Engineering Ltd. carries out an annual assessment of the global emissions of companies under its ownership, referred to as the A.E.S Engineering Group. This document concerns the fourth such assessment, covering a period of the 1st of October 2023 to the 30th of September 2024. The A.E.S Engineering group consists of a number of subsidiaries, some carry the AESSEAL name and serve as local and regional centres for sales, seal repairs, and in certain cases manufacturing and assembly. However, there are also a number of service-oriented companies who provide conditional monitoring, pump-repair and other reliability focused operations.

For well over a decade, AESSEAL has had a strong focus on sustainability and minimising both the impact that the company itself has on the planet, and the impact that our customers and industry has as well. The vast majority of products sold by AESSEAL are passive in nature with only a few certain product lines consuming any energy during their use, and nearly all products carry an environmental benefit to some degree. This can range from simple reductions in energy consumption through increased efficiency through to the most significant and meaningful reductions associated with the use of seal support systems in hot and evaporative processes.

Although the positive impact of these products far outweighs the negative impacts associated with their production, every business should be committed to reducing its own environmental impact wherever possible. The Company runs an integrated system that encompasses environmental and energy management amongst wider elements including quality and safety. Certification to ISO 14001 was first gained for its UK subsidiary in 2003, with many operational sites around the globe following. Further to this in 2012 the head office in Rotherham gained certification to ISO 50001.

In recent years, this focus and effort on sustainability within the UK has been expanded to the group of companies. A central part of this is the commitment to spend £29 million by the year 2029 on sustainability and environmental projects. Already this commitment has resulted in a significant number of high capital projects being undertaken at key sites

under A.E.S ownership, for further details on these projects and future efforts please refer to section 13 of this report.

The information and data gathered for the purposes of this inventory and report are key feedback to the 29 by 29 commitment, and the final figures of this inventory serve to act as the measure of success for many of these projects.

AESSEAL believes that operating sustainably is not only the right thing to do, but also good for business in the long-term. As time goes on and the effects of global warming become more severe, it is inevitable that all companies will need to work towards net zero. It will only become more important for companies to be clear and transparent about their contribution towards climate change, this assessment is important to allow the company to be very open about the negative impacts that the company does have.

3.2 Aims and Accessibility

A.E.S Engineering Ltd. undertakes this assessment and inventory report on a voluntary basis. This has been carried out for the primary purposes of transparency and open reporting of GHG emissions, in addition this inventory serves the secondary purposes of assisting internal carbon reduction efforts and efficiency improvements.

A.E.S Engineering Ltd. will make both this report and the verification certificate publicly available on the AESSEAL website. Both report and verification opinion statement will remain available until the following inventory is complete and they are succeeded.

3.3 Verification

This inventory and report have been independently verified to ISO 14064 Part 1 (2018) by a third-party, British Standards Institution. Verification has been carried out to a materiality level of 5% to a reasonable level of assurance. Please refer to the appendix of this report for the verification certification.

4 Scope

4.1 Organisational

A.E.S Engineering Ltd. is the parent company and owner of various A.E.S group companies operating across the globe, many of which (but not all) carry the AESSEAL brand name in their titles. A.E.S Engineering Ltd. maintains operational control of these subsidiaries that are covered within the confines of this GHG inventory.

4.2 Reporting Period

This inventory covers a customised 12-month reporting period from the 1st of October 2023, through to the 30th of September 2024.

4.3 Base Year

This reporting period is the fourth annual assessment of A.E.S Engineering Ltd., with comparable inventories having been conducted for the time periods of: 01-10-2020 to 30-09-2021, 01-10-2021 to 30-09-2022, and 01-10-2022 to 30-09-2023. For the purposes of this report each inventory is referred to in shorthand as 2020-21, 2021-22, or 2022-23 respectively.

There have been efforts made in order to increase the quality of data collection, scope, and calculation methods between each inventory as part of a commitment to continual improvement and in order to extract as much value from the inventory as possible, the most significant of these changes took place between the 2020-21 and 2021-22 inventories. However, as each inventory considers the same organisation and reporting period the baseline year remains the first such inventory conducted of 2020-21. Throughout this report, comparisons are made to the 2022-23 inventory for descriptive purposes, for a summarised comparison of progress over all inventories please refer to section 12 of this report.

Do note that there has been significant growth of A.E.S Engineering Ltd. over the duration of these inventories as measured by turnover, employed staff, or number of subsidiaries. These changes are discussed further within section 12 of this report.

4.4 Locations

There is significant variance in the size of sites covered by this GHG inventory, ranging from large energy-intensive manufacturing sites to very small regional sales offices. Please see appendix C for a list of the sites covered by this inventory.

4.5 Inclusions

This report covers all greenhouse gas emissions attributable to A.E.S Engineering Ltd. under the defined scope above.

All Scope 1 & 2 emissions are covered within the inventory report including: direct combustion of fuels, fugitive emissions from the release of refrigerant or other global warming gases, and the purchase of energy (predominantly electricity) generated off-site.

For the purposes of data collection and this report, Scope 1 emissions are divided between fleet emissions, supplied natural gas, other fuel consumption, and fugitive emissions. Supplied natural gas consists almost entirely of space heating, although do note that there are individual sites who do have space heating that is not covered by supplied natural gas. In these cases, the emissions as a result of this activity will be reported under either other fuel consumed (e.g., oil heating) or the relevant Scope 2 category (purchased heat for district heating systems). Final figures are reported per greenhouse gas and fuel as per the 14064-1 standard, the aforementioned subsections are for the purposes of better displaying the true nature and source of these emissions in the context of the organisation.

Scope 2 emissions for A.E.S Engineering Ltd. consist almost entirely of purchased electricity, although there are some instances of purchased heat which are also accounted for. Emissions arising from purchased electricity will be reported as both a location-based and a market-based total. With the market-based total reflecting the use of green tariffs where they are applicable, primarily within the UK, Germany, and the USA.

All relevant Scope 3 value chains have been included within this inventory, although it is noted that not all categories are applicable to the business. The Scope 3 Category numbers 10, 13, 14, & 15 are not relevant to A.E.S Engineering Ltd. and are thus not covered within this report.

4.6 Global Warming Potentials

Final figures for this inventory and reported in Tonnes of Carbon Dioxide Equivalent (CO_2e). Figures for both Methane (CH_4) and Nitrous Oxide (N_2O) are therefore reported in the units of tonnes of Carbon Dioxide equivalent. The conversion of absolute values to carbon dioxide equivalent has been carried out using the Global Warming Potential (GWP) of these gases, which are expressed in terms of the global warming potential of one equivalent unit of carbon dioxide. The GWP's used within this report are based on

the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) over a 100-year period so that the Conversion Factors are consistent with current national and international reporting requirements. Aside from CH_4 and Nitrous Oxide N_2O, GWPs are used to a lesser extent in the calculation of the impact of fugitive emissions in terms of carbon dioxide equivalent.

4.7 Corresponding Documents

To support this document A.E.S Engineering Ltd. also produces reports relating to its mitigation efforts against the emissions detailed within this report. These mitigation efforts consist of the use of purchased offsets as well as the environmental benefits of an A.E.S Engineering owned solar farm in the state of Maharashtra, India.

5 Methods & Verification

5.1 Approach

The basis of the approach adopted for completing this inventory is that of the GHG protocol which is linked to the Paris agreement. As mentioned the content of this report has been verified by a third-party, British Standards Institution. Verification is against the principles of ISO 14064 Part 1 (2018) with this inventory report prepared in accordance with this standard. Please see appendix for certification received from BSI.

Verification is to a reasonable level with anything below 1 tonne considered de-minimums, anything between 1 & 4% of the overall inventory total being of low significance, and anything of 5% or more treated as significant.

Throughout this report, emissions have been categorised according to the GHG protocol, for comparative purposes a corresponding table of results according to the ISO 14064-1 categories is included within sections 2 and 10 of this report.

5.2 Methods

For details of how emissions from individual categories have been calculated, please see the relevant category within sections 6, 7 or 9.

As a general approach, emissions are calculated from activity data gathered specific to that category. The best available method that can be used (as per GHG protocol guidance for that category) given the quality of data available is then applied in order to calculate emissions. Emissions factors utilised within this report are listed within the appendix, the majority of which are sourced from the GHG conversion factors published by the Department for Energy Security and Net Zero (henceforth referred to as DESNZ emissions factors as shorthand).

Note that due to the large number of sites and data collection that is required, some scaling of Scope 3 Emissions has taken place. The largest A.E.S subsidiaries will have full Scope 3 inventories calculated, note that many of the Scope 3 categories are applicable to a specific subsidiary or entity and not a specific site.

The method of scaling used will be that of linear regression with the independent variable to be the staff headcount of that respective site. For each category, a plot of emissions against employee headcount is carried out using the calculated data points. Linear regression is then used to arrive at an equation relating emissions to headcount for that category, the headcount of the data points to be scaled will be used in conjunction with

this equation to calculate emissions. Should a situation arise in which the y-intercept falls below zero, simple linear regression will be applied with a y-intercept forced to equal zero.

Note that this scaling method will also be applied for any Scope 1 or 2 categories in the event that data is unavailable for that site and category. This is primarily the case for certain new acquisitions that took place shortly before or during the reporting period.

Due to the structure of the business, with the majority of A.E.S subsidiaries tracing their supply chain to the largest single company and primary manufacturer of AESSEAL plc, this scaling method is inherently conservative. The calculated data points (including AESSEAL plc) represent the largest of the Scope 3 emissions, whilst those being scaled will offer minimal impact in comparison, even relative to the headcount of the entity. However, no such reduction or change in scaling method is introduced to reflect this. This is in order to follow the principles of being conservative in absence of direct data confirming otherwise. For more specific details on the errors and uncertainties of this method, please see section 11.

5.3 Data Collection

For the purposes of data collection to carry out this inventory, a centralised approach to data collection was undertaken. This was done to ensure consistency of reporting across the group and minimise the impact on branch staff involved in data collection. Wherever possible, data was sourced directly by head office using shared group systems in order to minimise impact and operate as uniformly as possible between group companies. However, there is significant variation between group companies as to how integrated each company is within these systems.

Shortly after the end of the reporting period in question, activity data was sought from branch heads relating to the activities required to complete the GHG inventory. Necessary delegation was then conducted by local branch heads in order to obtain all the data required.

5.4 Changes to Methodology from Previous Years

The baseline year for this inventory remains the first conducted inventory for the reporting period of the 1st of October 2020 to the 30th of September 2021. However, there have been multiple improvements to the method and approaches used in order to best reflect the true emissions figure of A.E.S Engineering Ltd.

For the purposes of transparency, improvements made to the methodology since the baseline year are as follows:

- Initially, spend-based emissions factors available from Quantis were used, which were worldwide averages based upon the WIOD. For both this inventory and the previously conducted 2021-22 and 2022-23 inventories, emissions factors have instead been used that are more specific to the location in which the goods and services were purchased. To better reflect the environmental impact of the company's value chain activities, in particular Scope 3 Category 1, nation-specific spend-based emissions factors have been used where available. These have been derived from the 2013 release of the World Input Output Database. In cases where the item has been procured from a nation where there is insufficient data to calculate an emissions factor, a rest-of-world emissions factor will be applied. Please see the relevant categories in later sections for further detail.

- In the baseline year, A.E.S sites were broken down into three levels of operation, these being significant operational sites (level 1), repair centres (level 2), and sales offices (level 3). An approach was taken where all level 2 and a representative sample of levels 2 and 3 were directly calculated, and the remaining smaller sites calculated from those with full datasets. This approach was taken for Scope 1, 2 and 3 emissions. For both this inventory and the previously conducted 2021-22 and 2022-23 inventories, with the aim of being more complete (and also identifying further areas to improve) every site was contacted to provide a full Scope 1 and 2 dataset, thus greatly reducing the uncertainty and error on Scope 1 and 2 emissions. As discussed previously, this scaling approach will still be applied for the Scope 3 emissions of the less significant entities, albeit with no distinction made between sites in terms of levels. This change was made as the differences between repair centres and sales offices that were included previously were only relevant to Scope 1 and 2 emissions and not to Scope 3 emissions.

- As part of data collection, information upon the number and size of refrigerant units and fire suppression systems will be gathered. Initially, information was only gathered in the cases of a leak occurring that resulted in fugitive emissions. It was decided that information should be collected regardless of a leak occurring in order to provide more confidence that fugitive emissions did not occur. This

change was implemented as a result of feedback from BSI during the verification of the 2020-21 inventory.

- Although not a change to the methodology in a way that could potentially alter results, it should be noted that efforts have been made for automatic categorisation of purchased goods and services for Scope 3 Category 1. This was a recommendation by BSI following the verification of the 2020-21 inventory. Where possible, primarily for companies using SAP, commonly purchased goods have been assigned a 'GHG Category' which corresponds to the emissions factors used by the WIOD & Quantis. Doing so substantially reduces the workload associated with Scope 3 Category 1 to allow focus of efforts on other problem areas.

- In such cases where there may be insufficient data to calculate fleet emissions, scaling will be conducted with the dependent variable being number of fleet vehicles and not staff headcount. In the initial inventory, scaled fleet emissions were calculated using site staff numbers which did not properly reflect the true usage of fleet vehicles at that site. This change was made following a recommendation from BSI as a result of the verification of the 2020-21 inventory.

- In the first such inventory, where heating was provided by a geothermal heating system, emissions were calculated using a DESNZ published emissions factor which was based upon the use of a combined heat and power unit. For both this inventory and the previously conducted 2021-22 and 2022-23 inventories, a specific emissions factor relating to geothermal heating has instead been used that better reflects the true emissions impact of these heating systems.

- In order to improve accuracy and consistency, changes have been made to the calculation of Category 1 emissions from previously conducted inventories. Categories for the WIOD are calculated from the emissions per specific industry sectors in a given country. In order to better align with this, the Standard Industry Classification of suppliers is used to determine which category purchases from that supplier fall into.

5.5 Acknowledgement of Areas to Improve

A.E.S acknowledges that despite best efforts, some uncertainty and error will remain within the figures reported as part of this inventory, please see section 11 for more details on this. A.E.S intends to improve upon this process year on year to ensure accuracy and

transparency in reporting emissions. Wherever improvements are identified by ourselves or others, these will be implemented if possible in future inventories.

A.E.S would like to acknowledge that the following error(s) have since been identified with the previous inventory, conducted for the period of October 1st 2022 to September 2023:

- AVT Ireland is a subsidiary of the A.E.S Engineering group which is based out of the same premises as AESSEAL Ireland in Cork, Ireland and AESSEAL MCK in Lisburn, Northern Ireland. AVT Ireland operates a small vehicle fleet in addition to the vehicle fleet of AESSEAL Ireland.

  In the previous inventory it was missed that this vehicle fleet had not been accounted for under AESSEAL Ireland, as a result five vehicles were not accounted for within the 2022-23 inventory. These vehicles were responsible for an estimated *11.9 Tonnes CO_2e,* as a result of this omission fleet emissions (and thus Scope 1 emissions) were mistakenly under-reported in the previous (2022-2023) inventory by *11.9 Tonnes CO_2e*.

- The subsidiary of Vulcan Engineering Limited operates an American regional headquarters in Burnsville, Minnesota. The US Environmental Protection Agency produces emissions factors based upon the regional grids (referred to as eGRIDs) operating within the continental United States. In the previously conducted inventory of 2022-23 the Scope 2 purchased electricity emissions for Burnsville, MN site was mistakenly calculated using the eGRID region of MRO East as opposed to MRO West.

  As a result of this error, Scope 2 emissions allocated to this site were over-reported by approximately *7.6 Tonnes CO_2e.*

6 Scope 1

6.1 Fleet Emissions

Fleet emissions are calculated in a varying manner according to the best quality of data available. The reason for this being that each subsidiary manages its own vehicle fleet and the methods of monitoring and recording activity consequently vary between them. Calculation methods however ultimately may be split between fuel-based, and distance-based approaches.

In cases where an organisation records the quantity of fuel consumed by owned vehicles for business purposes, the quantity of fuel is multiplied by the relevant DESNZ emissions factor. In cases where the fuel consumption is not recorded, the distance covered by each vehicle is used. DESNZ publish emissions factors per unit distance based upon fuel and engine size, these factors are used for any distance-based calculations within this inventory.

The source (and quality) of data for this category varies significantly between the group companies. For some companies, data quality is very high as a third-party organisation is utilised for the purposes of fleet management. This can be through a card scheme where transactions record the quantity of fuel purchased, or the entirety of fleet management being handled by a third-party. Fortunately, the larger companies with the most significant emissions (such as AESSEAL Inc. and AESSEAL Australia) tend to be those most likely to utilise such a service. Smaller subsidiaries are more likely to manage their own fleet vehicles and thus see more variation in data sources and quality. At the most extreme end as an example is AES Coldweld, which consists of a single owned vehicle used by the company. In this case there is no formal process in place by which expenses on fuel are singled out and an approach is therefore made based simply on distances provided by the vehicles most common user.

Owned vehicles by the A.E.S group are predominantly used by members of the sales team for travel. A.E.S does not operate any heavier freight vehicles for logistics, and it is not standard or common practice for products to be delivered to customers in owned vehicles outside of the delivery of specific seals by sales engineers in the event of a product breakdown or maintenance issue.

Of those sites where fleet emissions were calculated on a distance-based approach, a total of 2,490,725 kilometres were covered by A.E.S owned vehicles. Whilst those sites who track fuel use from owned fleet consumed a total of 480,891 litres of petrol and diesel.

Fleet emissions across the group are a very significant source of Scope 1 & 2 emissions – contributing 33.98% to the scope 1 & 2 total, and some of the largest single sources of Scope 1 & 2 emissions are the fleet emissions of the larger AES subsidiaries.

Category	CO_2 (Tonnes)	CH_4 (Tonnes)	N_2O (Tonnes)	CO_2e (Tonnes)
Petrol Vehicles	939.77	2.92	2.20	944.89
Diesel Vehicles	857.10	0.07	9.73	866.89
Hybrid Vehicles	65.09	0.08	0.57	65.74
Total Fleet Emissions	1,861.96	3.07	12.47	1,877.53

6.2 Natural Gas

Although there is no distinction within the GHG protocol or the 14064-1 standard between natural gas and any other fuel consumed by stationary sources on an owned site, a distinction has been made within this report due to the former's significance in comparison to all other consumed fuels.

Natural gas is exclusively used for the purposes of space heating and hot water provision at AES sites, primarily those in Europe and North America. There are no industrial or commercial processes for which fuel is consumed outside some very minor use of welding gases. Of those sites where information was gathered relating to natural gas use, 24 operated a gas heating system whilst 54 had no gas heating system.

The data quality and sources for natural gas provision are very consistent across the group. The data on fuel usage is sourced from utility invoices and meter readings provided by the utility companies. This quantity of gas consumed is then multiplied by the relevant DESNZ emissions factor, this being either the emissions per unit volume or per unit of energy depending on the metric provided by the utility company. In cases where a volume of gas is provided, conversion to kWh has also been carried out in order to contrast and compare between sites and other sources of emissions.

With regards to scaling, any sites which have no natural gas emissions are not included as data points for the scaling of gas emissions, this is to ensure that such sites do not contribute towards an under-reporting of scaled sites. Note that in particular this category results in a likely overestimate of emissions for those sites which were not calculated but scaled. Amongst the scaled sites there have been no exclusions from this category despite the likelihood of several sites such as those in Africa not operating a space

heating system. No attempt to exclude sites from this scaling were made in order to ensure that any underestimates present in the estimates (for those in the coldest climates) were sufficiently covered by the over-reporting from the warmest sites.

Natural gas use is responsible for 8.70% of the group's scope 1 & 2 emissions total, and in total A.E.S Engineering Ltd. used 2,628,180 kWh of natural gas during the reporting period.

Category	CO_2 (Tonnes)	CH_4 (Tonnes)	N_2O (Tonnes)	CO_2e (Tonnes)
Natural Gas	479.72	0.74	0.24	480.69

6.3 Other Consumed Fuels

This category refers to all stationary combustion of fuels on A.E.S sites excluding the aforementioned natural gas use. Although A.E.S does not consume any fuel as part of its standard manufacturing processes, there are isolated uses of fuels for various purposes across the group. The fuels in use, and purposes, vary between each case. For example, a number of sites purchase propane and LPG for forklifts, some purchase diesel for backup power generators, and some sites operate an alternative heating system to that of natural gas. It is the use of generators and alternative heating methods that are the significant energy users in this category, and consequently it is diesel and oil that result in the most emissions of all other fuels. Often for this category fuel is purchased to replenish stocks that are used on a regular basis, information about when the fuel itself was consumed is not always available. As a result, the approach is taken that fuel purchased within the reporting period is assumed to be consumed and is therefore reported as part of this inventory.

Of the sites contacted for emissions data 15 had emissions due to some form of fuel use outside of natural gas. Backup generators exist at sites in South Africa, the UK, and India. There are two sites, Kronau and Cork, which purchase fuel oil for their heating system. However, it should be noted that during the reporting period (August of 2024) the oil heating system at Kronau was decommissioned and replaced with an all-electric system. A further site, Jyväskylä, is leased and does not pay for heating directly or purchase any fuel and as such the emissions for this site fall under Scope 3, Category 8. It is known however and should be noted that the shared heating system within the building also uses oil.

The sources of data for this category are from the transactions for the purchased fuel, this can consist either of purchase orders raised for this fuel or from invoices and receipts for these purchases. Conversion to emissions is done using the relevant DESNZ emissions factor for each fuel and the unit (either mass or volume) that the purchase is measured in.

This category contributes 2.33% to the groups scope 1 & 2 emissions.

Category	CO_2 (Tonnes)	CH_4 (Tonnes)	N_2O (Tonnes)	HFC (Tonnes)	CO_2e (Tonnes)
Propane	11.96	0.01	0.01	0.00	11.98
Welding Gases w/CO_2	0.00	0.00	0.00	0.00	0.00
Diesel	57.88	0.01	0.73	0.00	58.61
Oil	48.32	0.13	0.11	0.00	48.56
LPG	3.04	0.00	0.00	0.00	3.05
Acetylene	6.68	0.00	0.00	0.00	6.68
Total	127.88	0.15	0.84	0.00	128.88

6.4 Refrigerants

This category refers to any direct fugitive emissions that have occurred, these being losses or emissions of gases that have a global warming potential without any combustion. During the reporting period there have been five sites which have seen instances of these losses, these being Mill Close – UK, Pune – India, Breda – Netherlands, Tampico – Mexico, and Selangor – Malaysia.

Pune, India has seen a frequent re-filling of R22 gas in certain AC units present onsite. In this case, the mass of gas replaced by the engineer is recorded on invoices for the visit provided by the maintenance provider It is suspected that in this specific case, top-ups may be being unnecessarily carried out as part of maintenance works and this is not truly reflective of a loss of gas. However, there is insufficient evidence to confirm this and in line with the standard methodology applied elsewhere any top-up of fluid is assumed to correspond with a loss of fluid equal in mass. These losses of 15.25 kg of R22 gas have resulted in the equivalent emissions of 26.84 Tonnes of carbon dioxide. In Selangor, Malaysia there have been two instances of a re-filling of R22 gas, totalling 13.60 kg and resulting in equivalent emissions of 23.94 Tonnes. In Tampico, Mexico,

there were three instances of gas being re-filled during annual maintenance. Two of these were R410a (2.65 kg of gas for 5.099 Tonnes) and one of which was R22 (1.00 kg of gas for 1.76 Tonnes). At Breda, Netherlands there was a single case of 3.07 kg of R32 gas being replaced during maintenance, which results in equivalent emissions of 2.08 Tonnes.

At Mill Close, UK there were two separate incidents of fugitive emissions both of which relate to the battery energy storage system on site. Firstly an amount of 2.90 kg of R32 gas was lost from HVAC unit within the system, which resulted in fugitive emissions equivalent to 1.96 Tonnes. In a separate incident, due to an error with the battery management system, a fire-suppression system within the container was mistakenly activated. This resulted in the release of 55kg of FK-5-1-12 gas being emitted, which carries a global warming potential of ~1 and therefore resulted in the equivalent emissions of 0.055 Tonnes.

At all sites, the mass of fluid is used for conversion into carbon dioxide equivalent using the relevant global warming potential. The mass of fluid that was replaced as part of maintenance is multiplied by the global warming potential of the gas to provide a carbon dioxide equivalent figure. Relevant global warming potentials are published by DESNZ for refrigerant gases whilst the global warming potential for FK-5-1-12 is provided by the supplier of the fire suppression system.

In total, these fugitive emissions contribute 1.12% to the group scope 1 & 2 total.

Category	Mass (kg)	HFC Eq. (Tonnes)	CO_2e (Tonnes)
R-32	5.97	4.04	4.04
R-22	29.85	52.54	52.54
FK-5-1-12	55.00	0.055	0.055
R410a	2.65	5.099	5.099
All Refrigerants	93.47	61.73	61.73

6.5 Scope 1 Summary by Source & Greenhouse Gas

Category	CO_2 (Tonnes)	CH_4 (Tonnes)	N_2O (Tonnes)	HFC (Tonnes)	CO_2e (Tonnes)
Fleet – Petrol	939.77	2.92	2.20	0.00	944.89

Fleet – Diesel	857.10	0.07	9.73	0.00	866.89
Fleet – Hybrid	65.09	0.08	0.57	0.00	65.74
Propane	11.96	0.01	0.01	0.00	11.98
Gases w/ CO_2	0.00	0.00	0.00	0.00	0.00
Diesel	57.88	0.01	0.73	0.00	58.61
Oil	48.32	0.13	0.11	0.00	48.56
LPG	3.04	0.00	0.00	0.00	3.05
Acetylene	6.68	0.00	0.00	0.00	6.68
Natural Gas	479.72	0.74	0.24	0.00	480.69
R-22	0.00	0.00	0.00	52.54	52.54
R-32	0.00	0.00	0.00	4.04	4.04
FK-5-1-12	0.00	0.00	0.00	0.055	0.055
R410a	0.00	0.00	0.00	5.099	5.099
Total	2469.57	3.96	13.55	61.73	2548.83

There has been a change in Scope 1 emissions of 218.49 tonnes, which represents an increase of 9.38% from the previous figure of 2,330.34 tonnes. This increase has been driven almost entirely by fleet emissions which have increased in absolute terms by 190.37 Tonnes from the previous inventory. Whilst the other categories have seen changes as are discussed below, it is the change in fleet emissions that is by far the most significant, with 87.13% of the increase in Scope 1 emissions being due to the increase in fleet emissions.

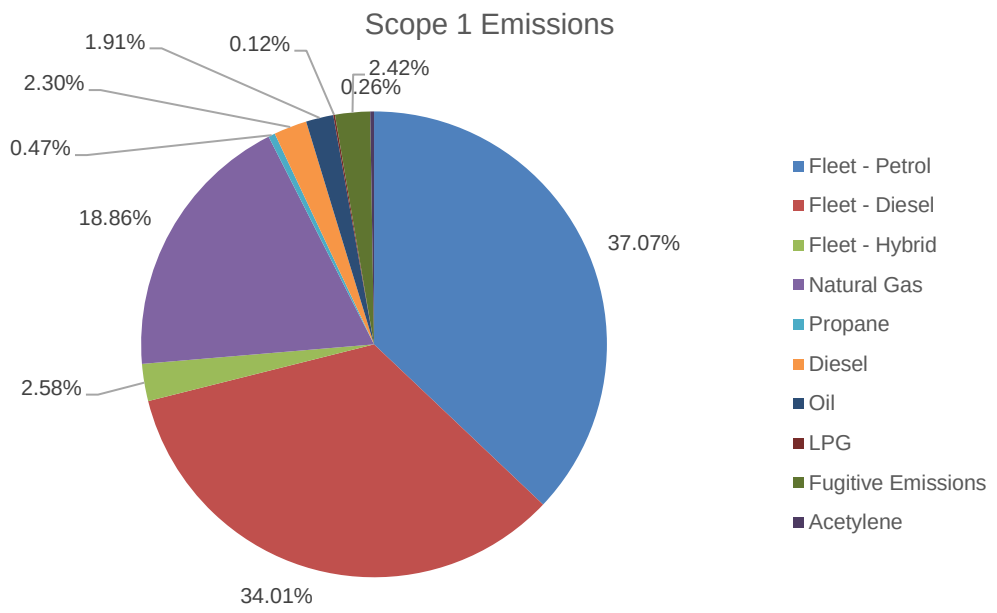
If considered relative to their previous values, it is fugitive emissions that have seen the largest increase at 101.17%. This category however is formed of isolated incidents and is not seen to be indicative of any long-term trend. Over the course of the four inventories that have been carried out there has been a significant increase and decrease in this category in between years. The source of fugitive emissions within this inventory is largely due to R-22, which carries a high global warming potential and has been phased out in the UK and much of Europe. Unfortunately, this is still used in the refrigerant systems in use at Pune. It is suspected that the maintenance company at Pune is unnecessarily providing top-ups of gas in order to display a level of service and

value for money on maintenance contracts. However, as the provided records indicate that this gas has been supplied, this quantity of gas has been accounted for.

The emissions due to the consumption of all other fuels has not seen a significant change in comparison to the previous inventory. Within this category, it is Diesel and Oil that contribute the most to emissions. It is expected that within the next inventory there should be significant improvements to the emissions from oil and as a result the emissions from this category overall. The primary use of oil within the business was for the heating system in use at Kronau, however this was decommissioned in the summer of 2024 and thus removes the majority of the oil use for the business. Diesel emissions are expected to remain at similar levels, improvements are expected at Pune where a UPS battery system has reduced the need for diesel generators. However, the site of Mill Close underwent an upgrade to its electrical mains incomer that necessitated the site running from generator over a weekend. This took place in November and thus falls outside the scope of this particular inventory.

Natural gas use has seen a small decrease in emissions by -3.98% from the previous inventory, natural gas use in general has now seen a sustained decrease over the course of the four conducted inventories. Falls from the previous inventory are partially the result of decreased consumption within the UK by AESSEAL plc. Improvements made at the Bradford site on insulation and roller-shutter doors have resulted in decreases at this site. The head office of Mill Close has also seen a reduction, this is expected to be the movement of staff into the new expansion to the building which is electrically heated.

As mentioned, fleet emissions have increased by 11.28%, an increase of 190.37 Tonnes. This increase is sustained and consistent across the group, with multiple subsidiaries seeing an increase in distance and emissions from the previous year. In addition, the acquisition of new companies & sites has contributed to an increase within this category. This increase has been a reverse in a trend of reduction that was witnessed within the previous two inventories.



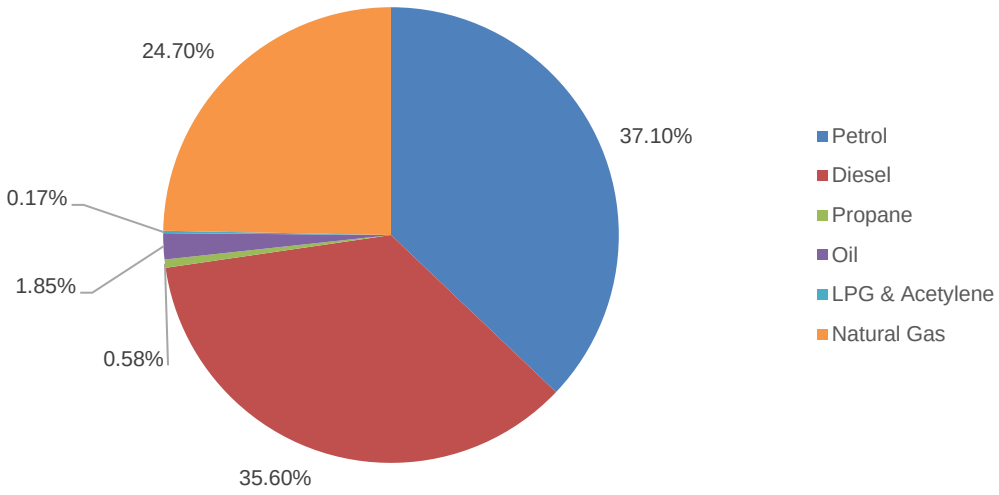
The split between categories within Scope 1 is broadly similar to previous years, with fleet emissions increasing their share of Scope 1 emissions at 73.66% of the total and natural gas being second at 18.86% of the total. This distribution is to be expected, as A.E.S does not use any fuels in any production or commercial processes on a large-scale. Energy use associated with the manufacture and production of goods is thus electrically based and falls under Scope 2.

As part of gathering data on Scope 1 emissions, it is also possible to obtain a breakdown in energy use across the group that contributes to Scope 1 emissions. Data for this breakdown is dependent upon the sub-category being measured. For natural gas use, most invoices provide an energy figure directly in kWh or Gigajoules, where a volumetric figure is reported the DESNZ figures for energy content of fuels are used to convert to kWh. For any other fuels, these same DESNZ figures are consulted to convert the mass or volume of fuel into an energy figure. Finally, for the case of fleet emissions which have been calculated on a distance-based method, DESNZ also publish energy figures on a per km basis (for the purposes of SECR reporting within the United Kingdom) that may be used to obtain an estimate on the energy use of the fleet.

The breakdown of energy and associated emissions by fuel is listed in the table below, with no distinction made between diesel used in owned vehicles and diesel used for on-site generators. Note that the table below does not consider any fugitive emissions from the loss of refrigerant gases as there is no combustion or energy use associated with these emissions.

Category	Energy (kWh)	% of Total by Energy	CO_2e (Tonnes)	% of Total by CO_2e (Non-Fugitive)
Petrol	3,947,985	37.10%	944.89	37.99%
Diesel	3,788,143	35.60%	991.25	39.86%
Propane	62,189	0.58%	11.98	0.48%
Oil	196,774	1.85%	48.56	1.95%
LPG & Acetylene	17,991	0.17%	9.72	0.39%
Natural Gas	2,628,180	24.70%	480.69	19.33%

Scope 1 Approximate Energy Mix



It is hard to predict Scope 1 emissions with accuracy for the following inventory. Past predictions for natural gas and other fuels have been accurate and it is expected for reductions to occur in the following inventory, however it is fleet emissions that dominate Scope 1 and thus have the most impact. The increase in fleet emissions from existing subsidiaries had not been predicted within this inventory.

Long-term, it is also fleet emissions that pose the most significant challenge in terms of reducing emissions through direct action. Although the UK has seen significant success through reducing emissions by the implementation of electric vehicles, it is not

possible to replicate this success across the group. In many countries and regions there is not sufficient electrical infrastructure to support a switch to electric vehicles. Some of the largest sources of emissions from the fleet category are from subsidiaries in the United States, Australia, and South Africa. These are all countries that do not have widespread electrical charging infrastructure, relatively large distances of travel for employees, and highly-carbon intensive grids that mean that switching to electric vehicles can be counter-intuitive.

7 Scope 2

7.1 Purchased Electricity

Emissions from purchased electricity form the vast majority of Scope 2 emissions for A.E.S Engineering Ltd.

Data gathering was conducted with the assistance of local branch staff who advised on the purchase and consumption of electricity at the site. The primary source of evidence and data for this category is invoices from the electricity provider at the site, in certain cases meter readings from the start and end of the reporting period were also provided. In a similar case to that of natural gas use, certain invoices do not provide a meter reading and only a monthly consumption figure, whilst in other cases a single invoice displays an annual consumption of electricity.

Consumption is recorded in kWh and a relevant local emissions factor is used to convert to a carbon dioxide equivalent figure. This category in particular is where a large number of different emissions factors are used to reflect the localised grids and networks from which different sites source their electricity. Where available, emissions factors published by a relevant national or regional government body are used. Should these not be available, emissions factors are primarily sourced from the most recent statistical profiles from the International Renewable Energy Agency. Please see the appendix for the full list of emissions factors used within this report.

As a result of the huge amount of variation in emissions factors, certain sites provide a disproportionately large contribution to emissions to the total figure within this category. Sites in South Africa and India for example have a very high emissions factor due to a very carbon-intensive local grid, and thus produce high emissions figures relative to their electricity use.

Note that both a location-based and a market-based total are provided, a number of sites purchase electricity on green tariffs. These sites being the UK sites belonging to AESSEAL plc, Warrington, Gloucester, Kronau, Rockford, and Sauerlach. As these sites are some of the largest electricity users within the group, particularly the head office of Mill Close, approximately 61.12% of the group's electricity is sourced on a green tariff which is up from 57.9% in the previous inventory. Purchased electricity accounts for 53.76% of the total scope 1 and 2 emissions on a location-basis.

Note that both a location-based and market-based figure are reported below.

Sub-Category	Energy (kWh)	Market-Based CO_2e (Tonnes)	Location-based CO_2e (Tonnes)
On Green Tariff	5,376,801.6	0.00	1,331.93
Standard	3,419,783.5	1,637.91	1,637.91
Total	8,796,585.1	1,637.91	2,969.84

7.2 Purchased Heat

There are two sites across the group which purchase heat through the use of a district heating system, these being Sauerlach in Germany and Breda in the Netherlands. Sauerlach utilises heat from local geothermal sources, the usage in kWh has been multiplied by an emissions factor sourced from research into the life-cycle emissions of geothermal heating. Breda is heated through waste heat from a local power station, the provider in this case offers a customs emissions factor specific to this grid.

The entire group purchased 334,389.2 *kWh* of heat energy during the reporting period, in total these sources result in emissions of 6.03 *tonnes* CO_2e which corresponds to 0.11% of the scope 1 and 2 total.

Category	Energy (kWh)	CO_2e (Tonnes)
Purchased Heat	334,389.2	6.03

7.3 Other

There are no other forms of purchased energy to report within A.E.S Engineering Ltd. during the reporting period.

7.4 Scope 2 Summary

Scope 2 Emissions for A.E.S Engineering Ltd. are comprised almost entirely of emissions due to purchased electricity, with the exception of just 6.03 tonnes due to energy sourced from district heating systems.

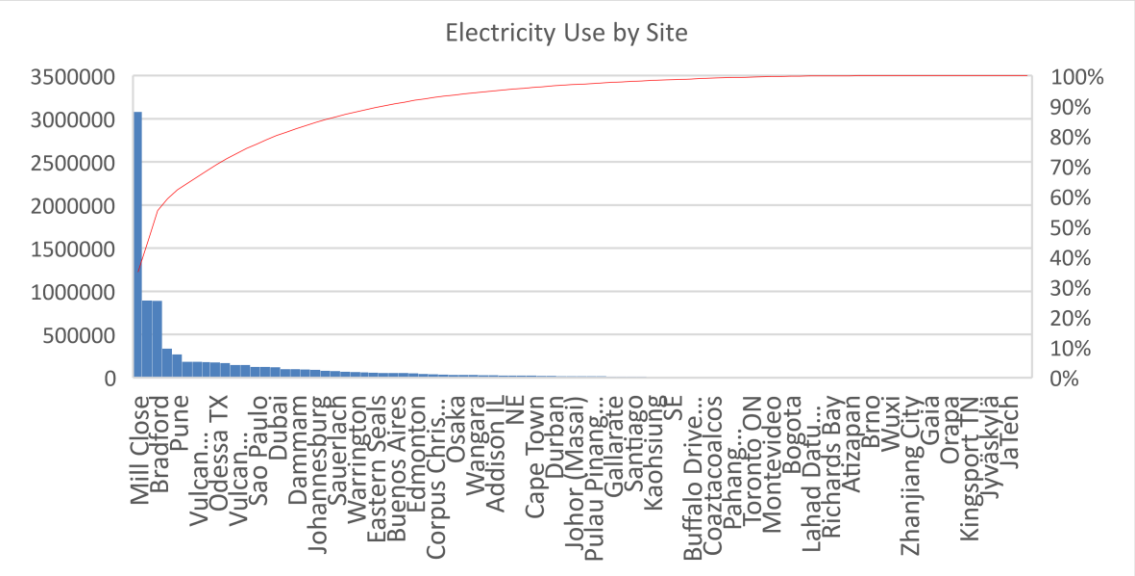
In comparison with the previously conducted inventory, scope 2 emissions have changed by 7.04% on a location-basis and by 6.89% on a market basis.

Total group electricity use (that falls within Scope 2) has increased slightly, at 3.94% up from a figure of 8,463,156 kWh seen during the previous inventory. It is suspected that contributing factors to this primarily relate to the growth of the company. There have been further acquisitions which have increased the size of the organisation from the previous reporting period. In addition, at the largest consuming site of Mill Close, a significant expansion was completed to the site. This expansion has allowed for more machinery to be located at the site, has increased the office space of the site, and is also heated electrically, all of which have contributed to an increase in electricity use at the site.

Electricity purchased on a green tariff remains a very high proportion of all energy consumed, at 61.12% of all group electricity. This is primarily due to a number of the key manufacturing sites being on green tariffs, in particular the head office of Mill Close, Rotherham. Other significant electricity users on green tariffs include the key manufacturing sites of Bradford and Rockford. As a result, the location-based equivalent of the group's green energy (and also the difference between overall market & location based figures) stands at 1,331.93 tonnes, an increase from 1,242 tonnes in the 2022-23 inventory. This increase is partially due to the increase in electricity use at the Mill Close site as discussed, as well as Rockford moving from a 90% green to a wholly green tariff.

There has been an increase of in the use of purchased heat energy by the group. It should be noted however that this refers to only two sites in Germany and the Netherlands, and the increase in emissions as a result of this change is very insignificant in comparison to the whole of Scope 2. Due to the very low contribution of purchased heat to both Scope 2 and overall, Scope 1 & 2 emissions, there are no specific policies in place for reducing the energy from purchased heat at this time as focus remains on the carbon-intensive use of space heating at other sites which fall under Scope 1.

Electricity use (and thus Scope 2 emissions) are heavily skewed towards just a handful of the larger sites which handle manufacturing duties, with just three sites (Mill Close, Bradford & Rockford) accounting for roughly half of group electricity use:



By observing the distribution of electricity use across the sites, this also is a good indication of the level of significance to the business of these sites.

The head office of Mill Close, Rotherham accounts for roughly a third of group electricity use at 35.02% of the group electricity total. In terms of environmental work, this centralised approach to manufacturing benefits the group for multiple reasons. Although not truly reflected within the figures, the products purchased by the multiple subsidiaries and sites are primarily manufactured at Mill Close where energy is purchased on a green tariff. Furthermore, the concentration of energy use amongst a select few sites means that concentrating resources on environmental projects at these sites allows a significant benefit from only a relatively small number of projects.

Category	Energy (kWh)	Market-Based CO_2e (Tonnes)	Location-based CO_2e (Tonnes)
Electricity On Green Tariff	5,376,801.6	0.00	1,331.93
Standard Electricity	3,419,783.5	1,637.91	1,637.91
Purchased Heat	334,389.2	6.03	6.03
Total	9,130,974	1,643.94	2,975.88

8 Scope 1 & 2 Summary

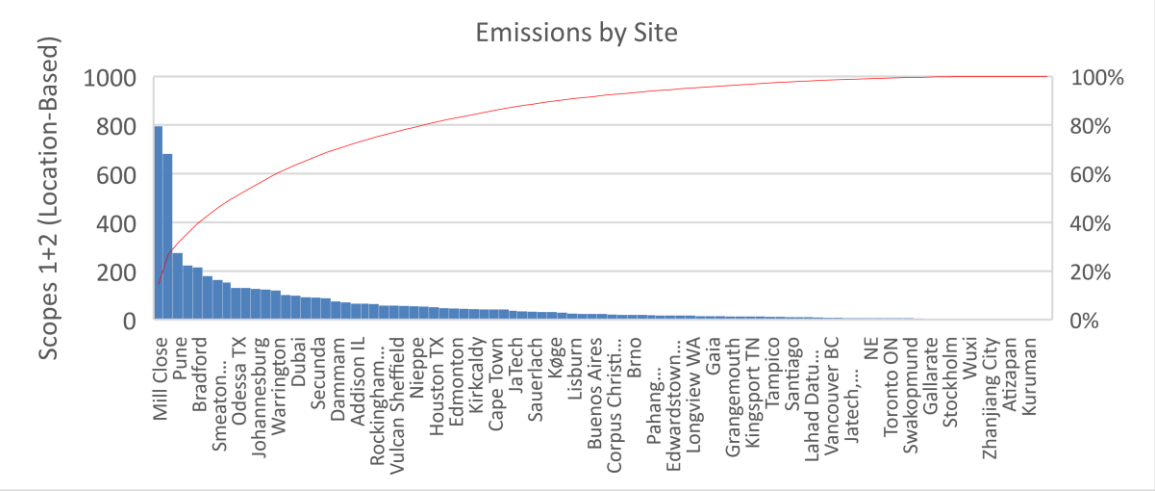
Emissions for Scope 1 & 2 are summarised below, Scope 2 emissions in this table are shown purely on a location-basis.

Category	Energy (kWh)	CO_2e (Tonnes)
Fleet – Petrol	3,947,985	944.89
Fleet – Diesel	3,298,889	866.89
Fleet – Hybrid	268,603	65.74
Natural Gas	2,628,180	480.69
Propane	62,189	11.98
Diesel	220,651	58.61
Oil	196,774	48.56
LPG & Acetylene	17,990.64	9.72
Fugitive Emissions	0.00	61.73
Purchased Electricity	8,796,585	2,969.84
Purchased Heat	334,389	6.03
Total	19,772,237	5,524.71

Scope 1 & 2 emissions remain dominated by purchased electricity, fleet emissions, and natural gas use. Together these three sources account for 96.44% of Scope 1 and 2 emissions. The percentage change in each of these categories from the previously conducted inventory is shown below, do note that these are absolute values and do not take into account the increase in size of the organisation between the two reporting periods.

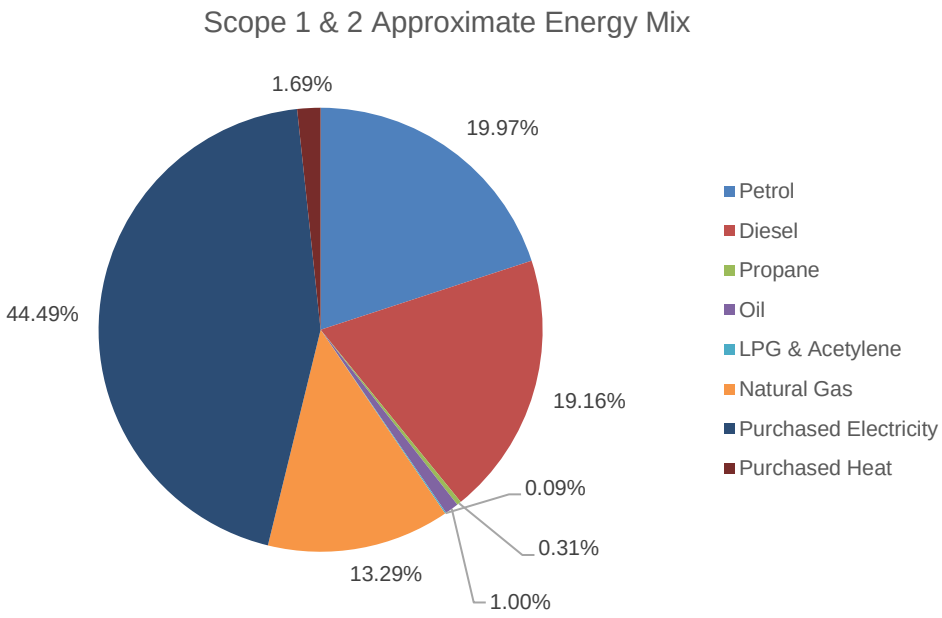
Category	Previous	Current	Change
Fleet	1,687.15	1,877.53	11.28%
Natural Gas	500.63	480.69	-3.98%
Purchased Electricity (Location-based)	2,776.61	2,969.84	6.96%

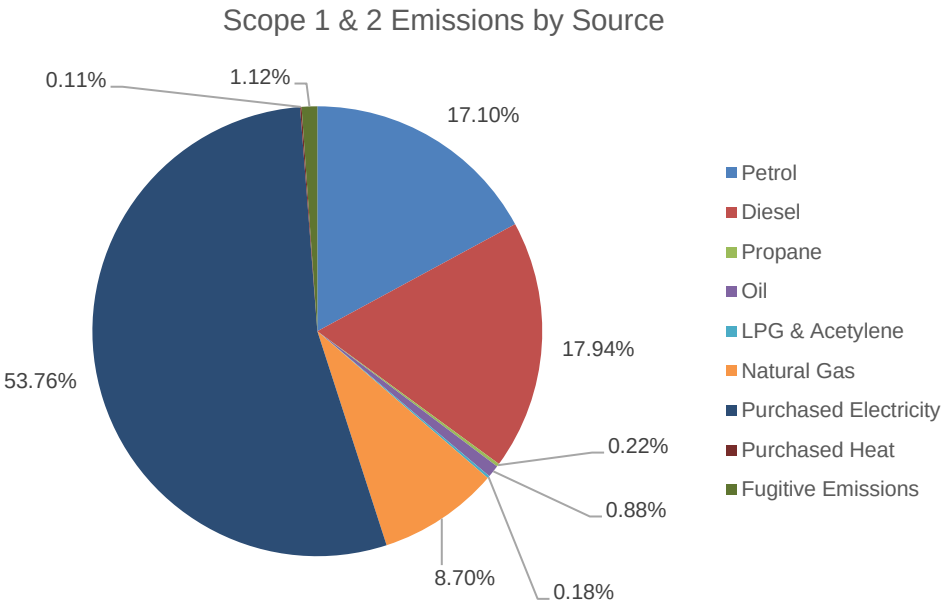
The distribution of emissions amongst sites is shown below, note that this is considering only a location-based total.



This once again demonstrates the contribution of a relatively small number of sites to the overall total emissions of the group, these being the key manufacturing sites and regional headquarters for the largest subsidiaries. Note however that the distribution is less skewed than the electricity distribution observed in section 7.4, this is because the presence of fleet emissions is of greater significance for the smaller sites and thus acts to create a more even distribution as opposed to electricity consumption alone.

It is also possible to demonstrate the overall energy mix of A.E.S Engineering Ltd. associated with Scope 1 & 2 emissions, note that in the below graphs, energy and emissions associated with hybrid vehicles falls under ‘diesel’.





As can be observed, Scope 2 emissions for the group are more carbon intensive than Scope 1. Scope 2 accounts for 46.18% of group energy use, but accounts for 53.86% of emissions. The average intensity of Scope 1 and 2 emissions are 0.2395 and 0.3259 kg CO_2e / kWh respectively.

9 Scope 3

9.1 Category 1: Purchased Goods and Services

Category 1 is the single largest source of emissions for A.E.S Engineering Ltd in all scopes. Calculation of this category has been undertaken on a spend-based approach, there is insufficient data available from the many suppliers and products involved that a supplier-specific approach is not possible to undertake.

As a result, a spend-based approach is the only possible means of calculating emissions embedded in purchased goods and services. Emissions factors for this category (these are also used in certain cases in other Scope 3 categories) are environmentally extended input-output analysis derived factors from the World Input Output Database released in 2013. For more details on the specific of how these emissions factors were derived, please see the appendix.

As a general summary of the approach, emissions factors are available in kg CO_2e per dollar spend in a specific industry in a specific country. The standard industrial classification (SIC, NAICS, ISIC etc) of the supplying company is used to assign all purchases from this company to the relevant WIOD category. Should it not be possible to formally identify the standard industrial classification of a company, the largest share of its goods is used to assign it to one, e.g. a supplier providing predominantly O-rings will be assigned to Rubber and Plastics. The dollar spend with that company is multiplied by the relevant WIOD emissions factor to calculate emissions.

In order to use the WIOD emissions factors conversion is required to September 2012 USD value, meaning that conversion is needed both from the local currency to USD and to account for inflation of the US Dollar from September 2012 to present. In order to be as consistent as possible, conversion to USD is done prior to adjusting for inflation. Doing so means that the significant variation in world currency inflation rates over the past decade is less liable to influence the resultant calculated emissions.

Conversion to USD is done on an average exchange rate representing the period of *01-10-2023 to 30-09-2024*. The International Monetary Fund publish exchange rates for major currencies [https://www.imf.org/external/np/fin/data/param_rms_mth.aspx], these are published on most weekdays. The average of all available values published within the reporting period is taken for each currency.

Once converted to USD, inflation will be accounted for between September 2012 (the prices used in the release of the WIOD) and April 2024, the mid-point of the reporting

year. Inflation data is sourced from the US Bureau of Labor Statistics [https://www.bls.gov/data/inflation_calculator.htm].

In certain cases, particular entries within the purchasing data may be excluded from this calculation method where these entries are calculated elsewhere in a different category. For example, where purchasing data includes any expenses on flights or hotels for which there is available invoice data, these entries are calculated using a more accurate distance or per night approach under Category 6 and are thus excluded from the calculations within Category 1.

Data sources for this category are the ERP systems through which the various AESSEAL companies operate. The most common ERP software in use across the group is SAP, although data has been sourced from other systems where they are in use.

This category is very significant for AESSEAL plc, due to the business model of the company many of the smaller subsidiaries purchase items from AESSEAL plc and thus do not see as significant a Category 1 figure. This business model does create additional complexities when considering a single entity or subsidiary within the A.E.S Engineering Group as an isolated case. As mentioned above, there is frequent purchasing of goods between A.E.S companies, primarily (but not exclusively) regional A.E.S subsidiaries purchasing from AESSEAL plc. In order to correctly calculate emissions, emissions are calculated when goods or services first 'enter' the group of companies when they are purchased from an external source. Failure to do so would result in significant double-counting of emissions if an item such as an O-ring is purchased by AESSEAL plc and then subsequently purchased from AESSEAL plc by a subsidiary. Note that this method does mean that considering single subsidiaries in isolation may be misleading, as the supply chain emissions of that entity are being covered by another A.E.S company.

Category 1 remains the most significant of all scope 3 emissions and contributes 62.26% to the overall scope 3 total. Within this category, the embedded emissions are most significant for the supply of Basic Metals and Fabricated Metal and Other Non-Metallic Mineral categories. These categories include many of the core components for mechanical seal manufacture and also tend to be the more carbon intensive industries per dollar spend than many other purchases within the supply chain.

Category	CO_2e (Tonnes)
Mining and Quarrying	116.75

Food, Beverages and Tobacco	107.43
Textiles and Textile Products	105.24
Leather, Leather and Footwear	1.84
Wood and Products of Wood and Cork	212.07
Pulp, Paper, Paper Printing and Publishing	402.48
Coke, Refined Petroleum and Nuclear Fuel	5.78
Chemicals and Chemical Products	1,758.27
Rubber and Plastics	20,331.83
Other Non-Metallic Mineral	12,305.51
Basic Metals and Fabricated Metal	15,171.72
Machinery, Nec	2,122.76
Electrical and Optical Equipment	1,332.87
Transport Equipment	38.26
Manufacturing, Nec; Recycling	12,218.29
Electricity, Gas and Water Supply	135.25
Construction	640.84
Sale, Maintenance and Repair of Motor Vehicles and Motorcycles; Retail Sale of Fuel	94.46
Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles	1,131.15
Retail Trade, Except of Motor Vehicles and Motorcycles; Repair of Household Goods	56.11
Hotels and Restaurants	14.34
Transport Services	133.53
Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies	9.39
Post and Telecommunications	482.16
Financial Intermediation	155.81
Real Estate Activities	18.98

Renting of M&Eq and Other Business Activities	439.00
Public Admin and Defence; Compulsory Social Security	66.40
Education	41.33
Health and Social Work	8.84
Other Community, Social and Personal Services	337.83
Total	69,996.53

9.2 Category 2: Capital Goods

In terms of calculation, category 2 is no different from category 1 in that this refers to embedded emissions in purchased goods and services. However, as per the GHG protocol a distinction is made where such purchases constitute capital expenditure. The calculation methods for this category are identical to that of category 1.

Data sources are largely similar to that of category 1, with the same data sources depending upon the ERP system in use at any particular subsidiary. Companies using SAP will log capital purchases within regular purchasing data as assets, whilst certain entities report this data for the purposes of the inventory on a more ad-hoc basis.

Category 2 is a particularly significant source of emissions for the largest subsidiary AESSEAL plc, note that the spend by A.E.S Engineering Ltd. itself is also allocated to the head office at Mill Close and thus is reported alongside capital expenditure of AESSEAL plc. Capital expenditure is particularly significant for A.E.S Engineering Ltd. due to the 29 by 29 environmental commitment, and for AESSEAL plc due to its position as the main manufacturing entity of the group of companies. Furthermore, it is fairly common practice for assets to be purchased by AESSEAL plc and then purchased by other group companies.

A notable exception to this general pattern is that of AESSEAL Australia Pty Ltd., where Category 2 emissions are significant and actually exceed Category 1 emissions for the entity. This is due to the construction of a brand-new head office in Queensland that occurred during this reporting period, as a result there has been very significant capital expenditure on construction work which is atypical for this inventory.

There has however been a significant decrease of -45.12% in emissions from the previous figure of 8,423.1 Tonnes seen in the last inventory. This is due to the presence of a large amount of expenditure on a significant construction project within the previous

inventory at the head office of Mill Close. Category 2 now stands at 4,622.89 tonnes of carbon dioxide equivalent, contributing 4.11% of the group's total scope 3 emissions.

Category	CO_2e (Tonnes)
Category 2	4,622.89

9.3 Category 3: Fuel and Energy-Related Activities Not Included in Scope 1 or Scope 2

Category 3 consists of the additional fuel and energy related activities that are not directly calculated within Scopes 1 & 2. This category refers to a number of emissions relating either to fuel consumption or purchased energy use. For the cases of fuel consumption (stationary or mobile), category 3 refers to the well-to-tank emissions of combustible fuels. In the case of purchased energy from electricity, this refers to the supplemental emissions that occur as a result of the additional generation needed to account for the losses in transmission and distribution in electricity grids.

As such, the data sources for this category are the same as those seen within Scope 1 and 2, with the activity data being quantity of fuel or amount of energy purchased. DESNZ publish emissions factors for well-to-tank emissions per quantity of fuel as well as factors for well-to-tank emissions from the generation of electricity in certain countries. To account for transmission and distribution losses, the additional energy needed is calculated using the gross grid loss of the grid in question. This is the same method used by the United States Environmental Protection Agency for calculation of transmission and distribution emissions within the United States. In cases of fleet emissions calculated on a distance-basis, DESNZ also publish emissions factors for well-to-tank emissions on a distance-basis as well.

The data sources for this category are therefore identical to those of Scope 1 and 2, and calculation of emissions occurs alongside the calculation of Scope 1 and 2 emissions.

This category is broadly proportional to the Scope 1 & 2 emissions of a site, with some variation occurring due to the varying gross grid loss and carbon intensity of the different electrical grids. This category contributes 1.45% to the overall Scope 3 total.

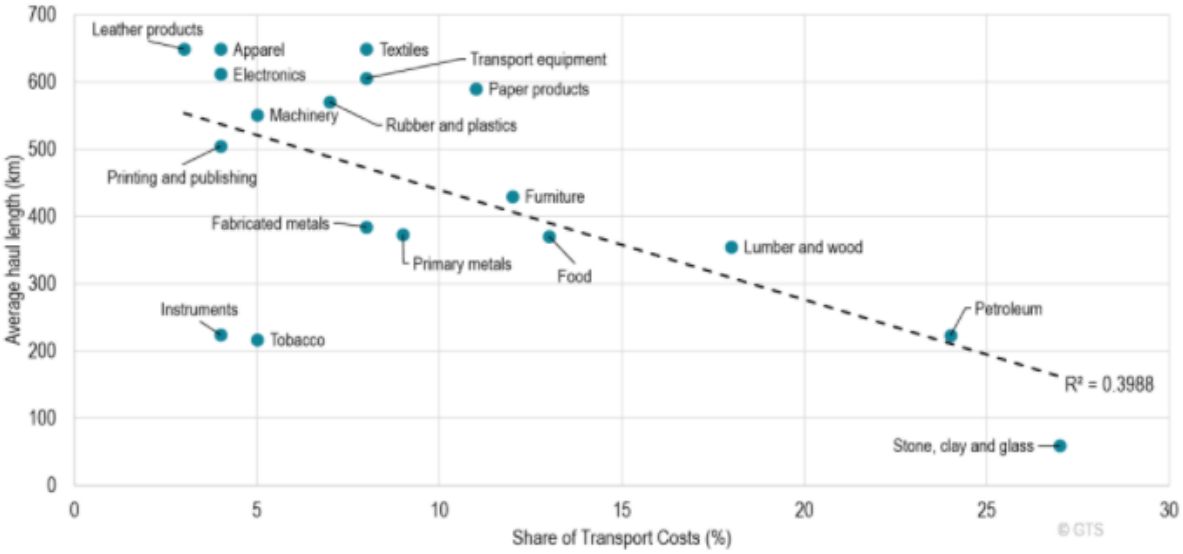
Category	CO_2e (Tonnes)
Category 3	1,628.73

9.4 Category 4: Upstream Transportation and Distribution

Category 4 emissions are to be calculated using the purchase orders of group companies within the reporting period. At present, there is insufficient data available on fuel consumption during shipping, or enough information to accurately assess the mass, and distance that items have travelled. Efforts are ongoing in future to record and tabulate weights of components and items within SAP which would allow a more accurate distance-based calculation to be carried out. However, at present this data is not available outside a limited proportion of the purchases made by AESSEAL plc, and not widely available enough to be of practical implementation for A.E.S Engineering Ltd. As per the GHG protocol, a spend-based method will be used instead.

Available data consists of supplying company, receiving company, item description and purchase order value. In order to assess the emissions due to transportation it is necessary to assume that a certain proportion of the value of the purchased item by the purchasing company is spent upon the transport of that good from the supplier to the purchasing company. This value will then be used with Environmentally Extended Input-Output emissions factors for Inland transport, Air, and Water transport from the WIOD 2009 database. These are the same emissions factors used for spend-based calculations by the Quantis Scope 3 calculator but broken down by industry sector and country.

When assessing the proportion of purchase order data that goes towards transport, a flat rate of *15%* has been chosen for all goods, those line items which refer to purchased services have not had any additional calculation made outside that of Category 1. This *15%* figure has been taken from data compiled on the transport of goods within the United States. [*The Geography of Transport Systems, FIFTH EDITION. Jean-Paul Rodrigue. New York: Routledge. ISBN 978-0-367-36463-2. 2020*].



% Share of transport costs for various types of good.

The majority of purchased items for plc have a % share of transport costs below *10%*, (Rubber & plastics ≈ 7%, primary metals ≈ 9%, fabricated metals ≈ 8%, machinery ≈ 5%). It is likely that in assigning a flat rate to all purchase orders, this figure would be less than *10%* given the make-up of purchase orders. To be overly-conservative as a result of the assumptions that have been made, a higher figure of *15%* has been implemented. As this higher figure does not represent a benefit in any other capacity, it is justifiable through representing an over-estimate of emissions from these categories.

Calculated separately from the above are the cases where AES companies have utilised the services of third-party couriers such as UPS or DHL for transport of components and products to other AES companies or customers. Note that there is significant variation amongst the group companies as to the proportion of items that go to either internal or external companies due to the structure of the business. AESSEAL plc manufactures and supplies products which are then sold and distributed to smaller AESSEAL subsidiaries for onwards sale. As a result of this, a significant proportion of the deliveries that AESSEAL plc pays for are to other AES companies. For these smaller companies however, the vast majority of deliveries are to end-users, with only some shipment to other AES locations.

For the most significant and some representative sites, data has been collected on the use of third-party logistics couriers to make a calculation of emissions. This calculation is ideally based upon weight, distance, and mode of transport though some assumptions have been made where all the above data is not available.

Logistics of both inbound and outbound goods falls under the Scope 3 categories 4 & 9, depending upon the subsidiary that is paying for this shipment to take place. Although

ultimately all contributing to the same grand total for A.E.S Engineering Ltd., due to the integrated supply chain of the business there is difficulty and lack of clarity in distributing these emissions between the various AES companies.

Categories 4 and 9 refer to upstream and downstream transportation and distribution logistics respectively. However, it should be noted that an important distinction is that when logistics services have been paid for by the company, these are considered upstream as they are a purchased service. Category 4 thus refers to logistics paid for by the company and emissions from the transport of products into the company regardless of who has paid this cost. Category 9 refers to downstream logistics, these being cases where a customer or third-party has covered the cost of shipping from an AES site.

As such, where emissions are calculated using the flat-rate method from company purchases, these emissions will be assigned to category 4. This will remain the case even when these purchases are from another AES company, due to the transport of these goods being covered (the majority of the time) by the receiving company. These datasets will be used to scale the entities where such a calculation was not carried out as per standard practice for this inventory.

Where emissions have been calculated from data provided by logistics companies, this will again fall under category 4. This being deemed as upstream as it is a purchased service by the purchasing company.

Category 4 thus ends up being one of the most significant categories of emissions for the entire group at 25.59% of the scope 3 total, behind only the emissions from purchased goods and services within Category 1.

Category	CO_2e (Tonnes)
Category 4	28,772.77

9.5 Category 5: Waste Generated in Operations

Category 5 concerns emissions due to waste produced from A.E.S Engineering sites. For non-operational sites the levels of waste generated are generally very low, as a result this category is a relatively low contributor to the overall value chain emissions.

Activity data for this category ideally consists of the mass of waste produced per particular waste stream, such as scrap metal, general waste, paper & cardboard etc. It is acknowledged that the quality of data for this category is poor, as it is rare for the waste

of mass to be recorded in any form outside of scrap metal. Very often it is the volume of waste that is recorded as the data source for this category is often the invoices and receipts from waste carriers. These invoices usually only detail the volume of the container that was removed, and not any information on how full or the mass of waste within the container. Assumptions on the density of the container are often made in order to make an estimate of the mass of waste.

Conversion to emissions is carried out on the basis of DESNZ emissions factors which are given in kg CO_2e per unit mass. Outside of DESNZ, there are very few emissions factors published for emissions from waste. Category 5 is very minimal and contributes only 0.12% to the overall scope 3 figure.

Category	CO_2e (Tonnes)
Category 5	132.56

9.6 Category 6: Business Travel

Data for business travel for all group companies was collected from local accounts records. The data included business travel from flights (both long haul and short haul), trains, taxis, hire cars, grey fleet and hotel stays.

Data collection for this category was again highly dependent upon the assistance of local branch heads for gathering data. Methods for data collection varied significantly across group subsidiaries and sites, the primary source of data for this category was accounting and financial records relating to expensed travel. In specific cases where it was not possible to determine a journey and an origin or destination was not available, the standard approach is to default to a spend-based approach and apply this to the expensed entry cost.

Calculation methods varied significantly across this category depending upon the particular form of travel being accounted for. Business flight emissions are calculated on a passenger kilometre basis using DESNZ emissions factors, specific emissions factors are chosen on the basis of flight distance as distinction is made between short, medium or long-haul flights. Distance for flights were calculated from the straight-line distance between the origin and destination airports.

Transport via train and taxi was calculated in a similar manner to that of flights using the origin and destination (if available) to estimate distance. DESNZ emissions factors were

applied for conversion to CO_2e, note that for taxi journeys an average petrol car was used as a default emissions factor in absence of information on the vehicle used.

Also included in this category are emissions from hired vehicles, note that in certain cases a leased vehicle fleet was used in a similar manner to an owned vehicle fleet. Calculation methods in this case were the same as those of an owned vehicle fleet, however emissions were allocated to category 6 instead of scope 1.

Hotel stays are also accounted for where appropriate, DESNZ emissions factors for hotel stays are the only source of emissions factors for this particular category and subset. Hotel stays are broken down by nights stay and country, source of data for this category and subset are again expense records from accounting departments.

Category	CO_2e (Tonnes)
Grey Fleet & Rented Cars	1,389.86
Air Travel	1,427.17
Taxis	14.31
Trains	28.35
Hotels	229.36
Other	45.53
Total	3,134.57

Air travel is one of the largest sub-categories within category 6, and the emissions from air travel may be further broken down as shown.

Category	CO_2e (Tonnes)
Domestic, to/from UK	22.28
Short-haul, to/from UK	112.53
Long-haul, to/from UK	554.76
International, to/from non-UK	737.59
Total	1,427.17

This table shows the emissions due to air travel broken down by the emissions factor by which they were calculated, these correspond to the DESNZ emissions factors used for the calculation of carbon dioxide equivalent emissions. In total category 6 contributes 2.79% to the overall scope 3 total.

Category	CO_2e (Tonnes)
Category 6	3,134.57

9.7 Category 7: Employee Commuting

Category 7 emissions refer to emissions arising from the travel of employees to and from site when not expensed or reimbursed by the company. Data for this category varies considerably amongst the subsidiaries depending upon the quality of data that was able to be provided.

Subsidiaries were asked to provide information and estimates on how employees travel to site, some sites are able to provide a detailed breakdown of the vehicle used and distance travelled due to the very small number of staff, whilst others provide simpler percentage estimates of the modes of transport used.

A detailed travel survey was carried out for the head office of Mill Close, this survey recorded the distance travelled by employees and the mode of travel. In any cases where subsidiaries were unwilling or unable to provide data on employees' personal commutes, the proportion of distances and modes of travel are applied to the headcount of that sire. Ultimately in all cases, this category is a distance-based calculation using emissions factors published from DESNZ.

This category contributes 2.19% to the overall scope 3 total.

Category	CO_2e (Tonnes)
Category 7	2,458.09

9.8 Category 8: Upstream Leased Assets

This category refers to the specific cases of rented/leased properties. In certain cases, a rented site may use common utilities as part of a larger building or group of buildings,

this is a fairly common occurrence for the smaller sites who may occupy one commercial unit in a much larger building. In these cases it is common for the site to pay rent but not to be directly billed for utility usage or for rent to vary with consumption. Indeed such sites may not have access to a meter for these utilities, or even have a meter that is specific to their consumption. In these cases, it is the landlord of the site who is purchasing and paying for utilities consumption.

In such cases, emissions arising from this fuel usage that is indirect are recorded under Scope 3, Category 8. By the very nature of the category, emissions within this category are entirely scaled as there is no consumption data. The scaling approach detailed in the general methodology is utilised in this case to make an estimation of energy consumption.

In total, there are 13 cases of sites having some shared use of a utility for which they are not directly billed. All of these sites are either electricity or natural gas with the exception of Jyväskylä, Finland, where the A.E.S site in question is part of a larger building which has a communal electricity supply and a communal oil heating system. In total, category 8 contributes 0.20% to the scope 3 total.

Category	CO_2e (Tonnes)
Category 8	223.39

9.9 Category 9: Downstream Transportation and Distribution

For details on the calculation of this category, please see the previous section on Category 4 for details.

Category	CO_2e (Tonnes)
Category 9	847.63

9.10 Category 10: Processing of Sold Products

Category 10 does not hold any relevance to A.E.S Engineering Ltd. All manufacturing and production work of A.E.S products are carried out at A.E.S manufacturing sites or repair centres and products sold by A.E.S are finished goods with no further production processes required prior to use.

9.11 Category 11: Use of Sold Products

Category 11 refers to the emissions that arise from the use of products sold by an organisation. Fortunately for AESSEAL, the vast majority of products sold are passive in nature and there is no consumption of electricity or fuel required for the product to operate.

The exceptions to this are three particular products created by the complex systems division and sold under AESSEAL plc. These three products do require an electrical input for the purposes of forced fluid circulation, these products are the PumpPac, FDU, and FDSC support systems.

A.E.S accounts for all emissions that would arise from the lifetime of the system in the year in which they are sold, as such sales data for AESSEAL plc is used to account for all of these systems that were sold between 01-10-23 and 30-09-24.

A worst-case scenario is assumed where the system is assumed to be operating continuously over the entire life cycle of the product, this is an overestimate however there is insufficient data for which to prove otherwise. This total time in use is multiplied by the maximum power draw of the product to result in a total lifetime energy use for that system.

This total energy use is multiplied by a custom emissions factor of 0.5668 *kg CO_2e/kWh*, which is an average of the UK, USA, China, India, South Africa, and Australia. This is used to represent a worldwide average emissions factor into which these products are sold.

In total these 19 systems sold are estimated to consume 915,420 *kWh* throughout their entire lifespan, in total this results in 520.39 *Tonnes CO_2e* and contributes 0.46% to the overall scope 3 total.

Category	CO_2e (Tonnes)
Category 11	520.39

9.12 Category 12: End-of-Life Treatment of Sold Products

Category 12 refers to the end-of-life disposal of sold products during the reporting period. The business model of A.E.S Engineering Ltd. does allow for frequent re-working and ‘re-lifing’ of products, however all products sold must eventually be disposed of.

Almost all the construction materials can be recycled or recovered due to metals making up the vast majority by mass of sold products, and it being cost effective and logical to recycle metal. Subsequent emissions from this disposal are assessed using DESNZ emissions factors for landfill and metal recycling alongside an estimate of the total mass of products sold during the reporting period. A conservative estimate of 90% being recycled and 10% going to landfill is made for the primary products sold by AESSEAL companies.

Mass of product sold is unfortunately not recorded across the A.E.S group, as a result two methods are used to estimate the mass of product sold for the manufacturing sites. Where sufficient quality data allows, data from logistics companies such as DHL or UPS is used to record the mass of packages leaving the site as an estimate for the mass of the products sold. This is likely an overestimate of the total mass of products, as there will be a portion of these package journeys that are transfer of components and products between A.E.S sites and not sold products. Should logistics data not be available, the waste metal of the manufacturing sites is taken as a starting point. This is combined with an assessment conducted of the % of purchased metal by weight that goes into final product to calculate the mass of product sold. The DESNZ emissions factors for landfill and recycling are used to arrive at a total CO_2e figure.

Conducted slightly differently is the category 12 figure for ProPack AG, a subsidiary of A.E.S Engineering Ltd. based in Germany. The primary product sold by ProPack is gland packing, which is subject to fouling and heating through its' use and is therefore assumed to not be recyclable at end of life. The sales data of ProPack is consulted to arrive at a mass of packing sold during the reporting period, this mass is used with the DESNZ emissions factor for landfill to provide an emissions figure.

Those manufacturing sites involved in mechanical seals and support systems result in the emissions of 85.08 Tonnes CO_2e, whilst ProPack is responsible for a further 44.65 *Tonnes CO_2e.* Category 12 contributions to the overall scope 3 total stands at 0.08%.

Category	CO_2e (Tonnes)
Category 12	85.08

9.13 Scope 3 Summary

Overall Scope 3 emissions stand at 112,422.62 tonnes, a reduction of -13.40% on the previous figure of 129,811.59 tonnes. This decrease in emissions has been driven primarily by reductions in categories 1 and 2.

Reductions in category 1 are primarily due to an improvement in methodology such that emissions factors utilised for purchases are better aligned with the data from which these emissions factors have been calculated, as discussed within section 5 of this report.

The reduction in category 2 was expected due to a substantial decrease in capital expenditure from the previous year. Both the 2021-22 and 2022-23 inventories saw a large amount of capital expenditure associated with a significant construction project increasing the size of the head office at Mill Close, UK. With this project at an end, overall group capital expenditure is down significantly even with some ongoing construction work in Australia taking place.

The breakdown of emissions between categories is broadly similar to that seen within previous inventories, with Scope 3 emissions being dominated by categories 1 and 4 at 62.26% and 25.59% of the Scope 3 total respectively. Both of these categories are strongly linked to the supply chain of the company and its' performance in general, A.E.S unfortunately exercises little control with which to reduce the largest categories of Scope 3 emissions.

Category	CO_2e (Tonnes)
Category 1: Purchased Goods and Services	69,996.53
Category 2: Capital Goods	4,622.89
Category 3: Fuel and Energy-Related Activities Not Included in Scope 1 or Scope 2	1,628.73
Category 4: Upstream Transportation and Distribution	28,772.77
Category 5: Waste Generated in Operations	132.56
Category 6: Business Travel	3,134.57
Category 7: Employee Commuting	2,458.09
Category 8: Upstream Leased Assets	223.39
Category 9: Downstream Transportation and Distribution	847.63
Category 10: Processing of Sold Products	0.00

Category 11: Use of Sold Products	520.39
Category 12: End-of-Life Treatment of Sold Products	85.08
Total	112,422.62

10 Summary

10.1 GHG Protocol

Scope	Category	CO_2e (Tonnes)
1	Fleet Emissions	1,877.53
1	Natural Gas	480.69
1	Other Consumed Fuels	128.88
1	Fugitive Emissions	61.73
1	**Scope 1 Total**	2,548.83
2	Purchased Electricity (Location-based)	2,969.84
	Purchased Electricity (Market-based)	1,637.91
2	Purchased Heat	6.03
2	**Scope 2 Total (Location-based)**	2,975.88
2	**Scope 2 Total (Market-based)**	1,643.94
3	Category 1: Purchased Goods and Services	69,996.53
3	Category 2: Capital Goods	4,622.89
3	Category 3: Fuel and Energy-Related Activities Not Included in Scope 1 or Scope 2	1,628.73
3	Category 4: Upstream Transportation and Distribution	28,772.77
3	Category 5: Waste Generated in Operations	132.56
3	Category 6: Business Travel	3,134.57
3	Category 7: Employee Commuting	2,458.09
3	Category 8: Upstream Leased Assets	223.39
3	Category 9: Downstream Transportation and Distribution	847.63
3	Category 10: Processing of Sold Products	0.00
3	Category 11: Use of Sold Products	520.39
3	Category 12: End-of-Life Treatment of Sold Products	85.08

3	**Scope 3 Total**	112,422.62

Scope	Category	CO_2e (Tonnes)
1 and 2	**Scope 1 and 2 Total (Location-based)**	5,524.71
	Scope 1 and 2 Total (Market-based)	4,192.77
3	**Scope 3 Total**	112,422.62
All	**All Scopes Total (Location-based)**	117,947.33
	All Scopes Total (Market-based)	116,615.40

10.2 ISO 14064-1

Category	Sub-Category	CO_2e (Tonnes)
1	Direct emissions from stationary combustion	609.6
1	Direct emissions from mobile combustion	1,877.5
1	Direct fugitive emissions arise from the release of greenhouse gases in anthropogenic systems	61.7
2	Indirect emissions from imported electricity (Location-Based)	2,969.8
2	Indirect emissions from imported electricity (Market-Based)	1,637.9
2	Indirect emissions from imported energy	6.0
3	Emissions from Upstream transport and distribution	28,772.8
3	Emissions from Downstream transport and distribution for goods	847.6
3	Emissions from employee commuting	2,458.1
3	Emissions from Business Travels	3,134.6
3	Emissions from Client and visitor transport	

4	Emissions from purchased goods	71,625.26
4	Emissions from the use of services that are not described in the above	
4	Emissions from capital goods	4,622.89
4	Emissions from the disposal of solid and liquid waste	132.6
4	Emissions from the use of assets	223.4
5	Emissions or removals from the use stage of the product	520.4
5	Emissions from end-of-life stage of the product	85.1

Category	CO_2e (Tonnes)
1. Direct GHG emissions and removals	2,548.8
2. Indirect GHG emissions from imported energy (Location-based)	2,975.9
2. Indirect GHG emissions from imported energy (Market-based)	1,643.9
3. Indirect GHG emissions from transportation	35,213.1
4. Indirect GHG emissions from products used by organisation	76,604.10
5. Indirect GHG emissions associated with the use of products from the organisation	605.5

11 Uncertainty & Estimates

A.E.S acknowledges that although every care has been taken to be as diligent as possible, for an undertaking of this size across the group there is always a degree of uncertainty. This section aims to quantify this uncertainty for the purposes of transparency and further improvement.

Throughout this inventory, efforts have been undertaken as per the ISO 14064 standard, to be conservative in cases of incomplete or unclear data. This means taking a worst-case scenario to over-estimate emissions should sufficient data be unavailable to prove otherwise.

Quantified uncertainty is the result of activity error, emissions factor error, and the scaling error. The activity error is the estimated uncertainty on the activity data figures with which emissions are calculated. The emissions factor error is the uncertainty on the accuracy of the emissions factors themselves, these are not published and are thus estimated at one percentage point per year since the factors were published. The scaling error, any uncertainty within the scaled figures as a result of the scaling approach.

11.1 Scaling

As mentioned previously, an approach was taken where certain data points are calculated and others are scaled. This varies between scope, with the vast majority of Scope 1 & 2 emissions sources being directly calculated whilst those it was not possible or reasonably practical to obtain were scaled. As focus was aimed at the largest and most significant sites, those sites which are scaled are the smaller subsidiary or satellite sites of regional head offices. For Scope 3, the most significant and also a sample of representative entities have had full datasets calculated whilst the smaller entities have their Scope 3 emissions scaled. Due to the business model of A.E.S Engineering Ltd, this introduces a slight inherent overestimation as the entities which are most emissions intensive are used as data points to scale the least emissions intensive data points.

To recap the scaling method, linear regression or single regressor models are used to scale emissions. Each data point is an emissions figure for a particular category for a particular site, e.g. fleet emissions for Mill Close is a single data point. Every data point which has been directly calculated is plotted on a graph with emissions on the *y-axis* and the headcount of the site as the *x-axis*. The only exceptions to this being fleet emissions, where the *x-axis* is the number of vehicles for that site, and purchased electricity where the *y-axis* is electricity consumption in kWh. These two cases are to better represent estimated fleet distance and to allow for the high degree of variation in grid emissions factors respectively. Once this graph is plotted, a linear regression model is used to

calculate the relationship between the measured data points and the independent variable. In cases where the *y-intercept* falls below zero, a single regressor model is used. The equation for this relationship is then used to calculate the scaled data points using the headcount of number of vehicles for all the data points that need scaling.

In certain cases, calculated data points have been excluded from the regression models but still carried towards the final total. This is the case for data points which are not representative of the other sites or may be considered outliers to the overall trend for that particular category.

Scaling is aimed to be kept to a minimum in order to reduce the uncertainty on the final figure. A key measure of the uncertainty on any scaled figures is from how many data points the regression model has been calculated, a regression model based on a greater number of calculated data points can be considered to be more reliable. Similarly there will be scaling error on any scaled data point, and reducing the number of data points that require scaling thus reduces the total error for that category.

By Number of Data Points	Calculated %	Scaled %	Total %
Scope 1	87.62%	12.38%	100.00%
Scope 2	94.35%	5.65%	100.00%
Scope 3	66.31%	33.69%	100.00%
Total	75.75%	24.25%	100.00%

Note however that it all the larger and more energy-intensive manufacturing sites are calculated whilst the scaled data points are made up of smaller less significant sites. Thus observing purely on the number of data points is not a true representation as a single ‘data point’ such as purchased electricity – Mill Close, will be substantially greater than the combined purchased electricity emissions of many of the smaller sites. As a result, the % of emissions data that is scaled is less than that of the number of data points themselves.

By Emissions	Calculated %	Scaled %	Total %
Scope 1	90.73%	9.27%	100.00%
Scope 2	89.05%	10.95%	100.00%
Scope 3	85.40%	14.60%	100.00%

Total	85.61%	14.39%	100.00%

To give a true representation of the level of data that has been directly calculated to that which has been scaled from the calculated data, it is necessary to 'weight' each data point as to its significance towards the overall total. To do this, each data point may be multiplied by the independent variable to give it a value that reflects its significance. The calculated versus scaled totals for the inventory are shown below.

By Emissions	Calculated %	Scaled %	Total %
Fleet	97.05%	2.95%	100.00%
Natural Gas	98.12%	1.88%	100.00%
Other Fuels	96.50%	3.50%	100.00%
Purchased Electricity	98.31%	1.69%	100.00%
Category 1	97.61%	2.39%	100.00%
Category 2	92.91%	7.09%	100.00%
Category 4	97.64%	2.36%	100.00%
Category 5	87.60%	12.40%	100.00%
Category 6	96.11%	3.89%	100.00%
Category 7	97.10%	2.90%	100.00%
Category 9	0.00%	100.00%	100.00%

Note that due to the methods by which logistics emissions are reported, Category 9 will always consist of fully scaled data points. This is because those sites/entities for which data was available are those who provided data from paid courier services which under the GHG protocol would fall under Category 4 and not Category 9.

Another determining factor of the uncertainty on the final figure with regards to scaling is the quality of the regression from the calculated data sets. A clear relationship between emissions and headcount leads to a higher degree of confidence in this relationship holding for those sites which are scaled using headcount as a measure. The quality of this relationship is measured by the coefficient of determination, denoted by R^2.

Category	R^2

Fleet	0.7111
Natural Gas	0.7937
Other Fuels	0.0417
Electricity	0.8613
1	0.9318
2	0.7790
Inbound Logistics	0.8026
5	0.6009
6	0.7162
7	0.9685
Outbound Logistics	0.8036

Do note however in the above table that inbound and outbound logistics are listed, as due to the distinctions of the GHG protocol some outbound logistics are later reassigned to category 4. The coefficients of determination are encouragingly high for the majority of categories where scaling is necessary on a significant scale.

Note that with the scaling of Natural Gas emissions, it is necessary to exclude a large number of calculated data points from the scaling method in order to not underestimate emissions. Sites in general may be divided between those that operate a space heating system (primarily natural gas) and those that do not due to their location and climate. Any ‘calculated’ data points which consist of sites which have no natural gas use are excluded from the scaling for this category. This is done so in order to not artificially skew the scaling of natural gas sites by including sites which report zero emissions within this category.

Those categories with the lowest coefficients of determination are Other Fuels and Scope 3: Category 5. Encouragingly, these are the two lowest significance sub-categories of emissions and thus do not contribute significantly to the overall error.

Poor correlation in other fuels was to be expected as this is highly dependent upon the site itself, and there is little common purpose even amongst those sites with other fuel consumption. For example, other fuels use varies from a very small amount of propane consumption for a single forklift to significant oil consumption for heating the entire site.

Further introduce that there is variation in carbon intensity of the fuel being consumed and it is not surprising that this category sees a poor correlation.

Category 5 refers to emissions from waste produced by group sites, it is acknowledged that this category is an area where data quality is poor. Accurate data on waste has been found to be hard to source at many sites, few sites keep records on the mass of waste produced aside from scrap metal collections. Accordingly, in many cases the mass of waste is therefore estimated from the volume of waste collections from the site, which itself has a high amount of variation as a metric. Volumes are assumed to be the maximum volume of the container collected as a worst-case scenario in absence of any detailed data. Furthermore, the poor correlation of this category is somewhat attributed to natural high variation between emissions of this category between sites, and some artificial variation which is introduced into the emissions figures from the lack of detail and availability of emissions factors.

In addition to this variation in data quality, there is also significant real and natural variation in emissions for this category between sites. Firstly, the volume of waste is very dependent upon the activity being carried out at the site. The manufacturing sites of the group produce significantly more waste per staff member in comparison to the sales offices and repair centres. Furthermore, emissions from the disposal of waste produced are highly dependent upon the means of disposal. The means of disposal are themselves highly dependent upon local conditions, legislation, and availability of recycling services in proximity to the site. Even sites which produce similar volumes of waste may therefore see significant differences in resultant emissions as a result of local services. For example, in Germany all landfill waste has been eliminated, whilst elsewhere a similar site may see much higher emissions as a result of landfill being the standard method of disposal within that country or region. Secondly, emissions factors for the disposal of waste are not available outside the published emissions factors by the UK DESNZ figures. These figures do not properly distinguish between emissions from the recycling of different waste streams, only distinguishing between the emissions of landfilling different waste streams. As a result, even a small amount of landfilled waste may inflate a sites Category 5 emissions relative to another site which produces a larger volume of recycled waste.

11.2 Fleet Emissions

Concerning fleet vehicles, calculations for fleet emissions have been predominantly made using a distance-based method from the mileage of company vehicles during the reporting period. In certain cases, a more accurate fuel-based method has been used

as data on fuel consumption is recorded for these entities. In general however, the accuracy of these figures is dependent upon the accuracy of which the mileage of these vehicles is recorded. As this is data that is tracked and recorded by the vehicle as in use, accuracy in terms of measurement of the distance covered is assumed to be high.

However, methods with which to verify and corroborate odometer mileage varies significantly across group companies due to the difference in management of fleet vehicles. In some cases such as AESSEAL plc, personal and business miles may be compared to records on the odometer to ensure accuracy, whilst elsewhere only the mileage of the vehicles is recorded without any supporting data collection to verify the mileage is a true representation of company use. As a result of these limitations, activity data on fleet mileage is assumed to be only 95% accurate.

11.3 Natural Gas

Activity data for natural gas use is collected predominantly from invoices provided by suppliers on gas consumption. This has been assumed to have a high level of accuracy as this is data supported by meter readings and energy companies have an inherent interest to assess consumption in order to facilitate payment. Accuracy for this category has been assessed at 99%.

11.4 Other Consumed Fuels

Fuels within this category are diesel, oil, and bottled gases. However, in all cases the data sources are purchasing records and invoices displaying the amount of purchased fuel. Depending on the fuel in question, these receipts and invoices display either a volume or mass of gas supplied. Accuracy of these invoices with respect to keeping records of the containers supplied is considered very high. Uncertainty for this category will thus depend upon the level of accuracy for which the receipts may be relied upon for recording the amount of gas within these containers. Accuracy for this category has been assessed at 95%.

11.5 Refrigerants

Refrigerants and fugitive emissions are the result of leaks or top-ups highlighted in maintenance reports. In each case, the mass of refrigerant has been sourced from a maintenance log which show the amount of refrigerant that was required to replace lost amounts. It is hard to assess however, the accuracy of which the fluid replaced was measured by the maintenance personnel conducting the required work and the tools

they had available to record the refrigerant supplied. As a result of these limitations the accuracy of activity data for this category has been assessed at 75%.

11.6 Purchased Electricity

Activity data for purchased electricity is predominantly sourced from invoices for utilities provided by utility companies. As with natural gas, it is assumed that this carries a high level of accuracy due to the availability of accompanying meter readings with which to corroborate this data and the necessity of the utility companies to ensure correct payment. As with natural gas, accuracy of this category is assessed at 99%.

11.7 Purchased Heat

Purchased heat only holds relevance for two sites across the group. In both cases, invoices are the source of activity data. Accuracy of activity data is again assessed to be 99% as with natural gas.

11.8 Categories 1 & 2

Category 1 and 2 data is sourced from ERP systems in use by group companies. Accuracy of financial data is assumed to be high and reliable due its necessity to operations and preventing any fraudulent or dishonest practices. As a result of this, accuracy has been assessed at 99%.

11.9 Category 3

Category 3 emissions are derived from the same activity data as seen in Scopes 1 and 2. For some categories such as purchased electricity and consumed gas, the activity data for category 3 is simply consumption and the accuracy as such is the same as the categories for which this data was collected. Elsewhere however well-to-tank emissions are also the result of distance-based calculations for fleet use where some uncertainty does lie. As a result of this, accuracy of this category is assessed at only 95%.

11.10 Categories 4 & 9

The processes where evaporative savings can be witnessed are often hot and viscous processes in

As mentioned previously, categories 4 & 9 are the areas for which sufficient data was not available to make an accurate assessment as was hoped. Accordingly, a spend-based method was used using the category 1 and 2 data provided. Although the accuracy of this source data is high, uncertainty will be introduced through making an assessment of the proportion of orders spent upon logistics. It is recognised that this is an assessment that will vary considerably across materials, products, and location.

Also included within this category are emissions calculated using a distance-based approach from logistics data. This will carry a higher degree of accuracy but there are still some assumptions made in absence of detailed data on exact routes and distances taken.

As a result of this, activity date for both categories 4 & 9 are assessed to be only 85%.

11.11 Category 5

Category 5 data is again predominantly sourced from invoices, in this case invoices provided by waste disposal services relating to the volume or mass collected from each site. Whilst these invoices may be considered accurate in terms of the collections and containers removed, they often do not make any assessment of the mass of waste itself. Frequently throughout this category an on-going assumption has been made that the container volume collected was entirely full when collected, previously assessed densities of each waste have been used to then convert this volume into a mass for use in emissions calculations.

This method has been selected as an overestimate; however, it is still an estimate, and it is difficult to say across the entire group how close this estimate will be to the true mass of waste disposed. As a result of this, accuracy for this category has been assessed at only 80%.

11.12 Category 6

Business travel emissions itself has been sourced from various means within this category. Emissions due to hotel stays are discrete and usually tied to expense reporting and can thus be considered very accurate. Other sources such as flights and hire cars are less accurate, this category is usually recorded by companies in the form of cost and expense from an accounting perspective. Distances covered in hire cars or exact routes on flights are thus not reliably and accurately recorded, even if the expense data from which they are derived is.

Due to the difficulties in determining the exact measurable quantities needed, accuracy for this category has been assessed at 85%.

11.13 Category 7

It is recognised that there are significant estimates that have been made with respect to employee commuting. It is not feasible for the exact route and distance for which employee travels to work to be assessed across the company. Data quality across sites thus varies significantly, some sites have provided a mode of transport and approximate distance for each employee, and other sites were not able to provide any

information relating to this category at all. Accordingly, a reasonable proportion of these sites were assessed using the breakdown of transport mode and distances observed in the most detailed assessment available, the transport report conducted for the head office of Mill Close, Rotherham.

It is recognised that there will be significant differences between some sites and the head office. In general however, for those sites where this estimate has been applied it is likely that levels of employees travelling by private car are likely to be lower and this may thus be considered an overestimate. However due to these estimates, accuracy for this category has been assessed at only 75%.

11.14 Category 8

Category 8 refers to scaled figures for utilities which fall under the Scope 3, the error and uncertainty in this case is thus comprised of only the scaling error and emissions factor error.

11.15 Category 11

As with other categories, when estimates have been made for this category they have been conducted by assuming a significant overestimate in order to ensure that no under-reporting occurs.

In this case, this refers to the complex systems sold being assumed to run continuously at all hours of the day for their entire lifecycle. A situation which would almost certainly never occur. Due to the length of time involve in making an assessment of use over a product's entire lifecycle, accuracy of this category is assumed to only be 85%.

11.16 Category 12

Category 12 emissions calculated are based upon the mass of products sold and thus eventually disposed of. For most cases (unless a spend-based approach was used) the source of data used was the weight carried by logistics carriers outbound from the site. Accuracy for the weight measured by this approach is considered high. In some cases an alternative approach was used, a detailed assessment of material yield was conducted which may be considered accurate. This assessment was conducted at the head office at Mill Close using a representative range of products. It is recognised that this category include both uncertainty with this assessment and the uncertainty of category 5 from which metal scrap data is sourced. Accordingly, accuracy for this category is assessed at only 75%.

11.17 Emissions Factor Uncertainty

The final component of uncertainty is any error on the emissions factors themselves used to calculate emissions from activity data. Very rarely is any assessment of error provided alongside publications of emissions factors. As a result, an approach has been taken to apply a percentage point of error for all emissions factors used within this inventory.

11.18 Summary of Uncertainty

Scope	Total CO_2e (Tonnes)	± (Tonnes)	% Error
Scope 1	2,548.8	197.1	7.7%
Scope 2	2,975.9	87.3	2.9%
Scope 3	112,422.6	8,823.8	7.8%

12 Comparison between Inventories

There have now been four annual assessments of the emissions of A.E.S Engineering Ltd., the results of which are displayed below.

Inventory	Scope 1	Scope 2 (Location)	Scope 2 (Market)	Scope 3
2020-21	2,634.20	2,914.90	2,036.60	89,048.00
2021-22	2,439.08	3,102.32	1,994.38	128,655.17
2022-23	2,330.34	2,780.21	1,538.04	129,811.59
2023-24	2,548.83	2,975.88	1,643.94	112,422.62

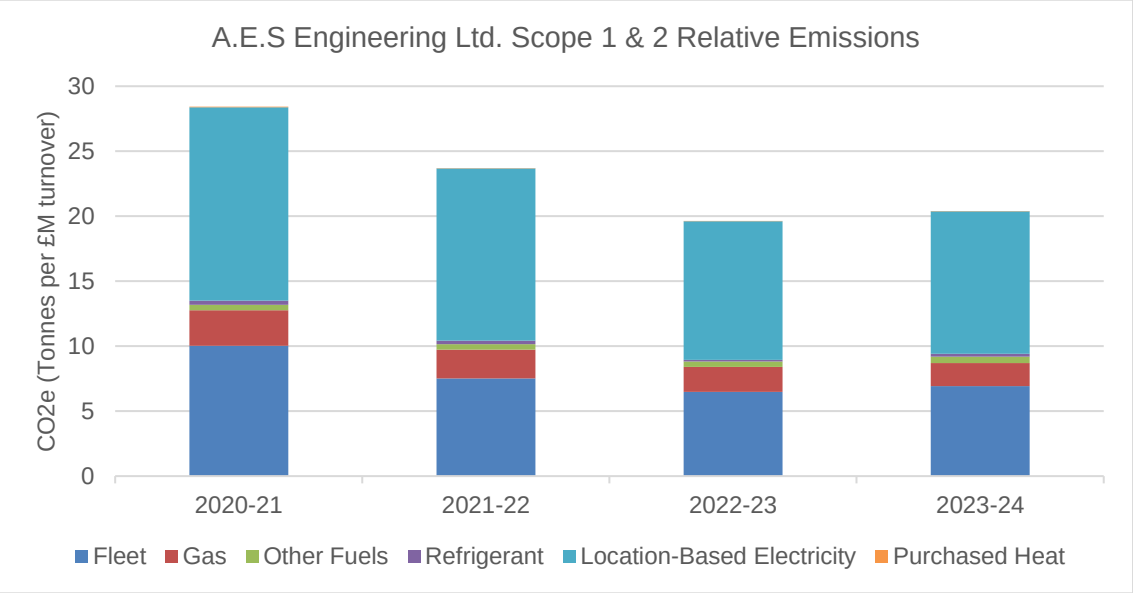
There have been significant changes between each of these inventories, both in terms of calculation methods and also in the size of the organisation. Change in Scope 3 between 2020-21 and 2021-22 are predominantly due to an improvement in the data collection methods utilised between these inventories.

Scope 1 & 2 emissions however have remained reasonably consistent in absolute values across the four inventories. Although significant projects have been undertaken during this time in order to target some of the largest single sources of CO_2e, this has been countered by overall growth in the company in activity, as well as the acquisition of multiple companies.

As such it is also useful to consider these values relative to the size of the organisation, as measured by the turnover of A.E.S Engineering Ltd. in the calendar year in which the majority of the reporting period falls:

Inventory	Turnover (Millions of £)	Scope 1 per turnover	Scope 2 (Location) per turnover	Scope 2 (Market) per turnover	Scope 3 per turnover
2020-21	195.14	13.499	14.938	10.437	456.338
2021-22	233.84	10.430	13.267	8.529	550.175
2022-23	260.43	8.948	10.675	5.906	498.451
2023-24	270.76	9.414	10.991	6.072	415.217

Scope 1 and 2 emissions have been fairly consistent in absolute terms across the four conducted inventories, when considered relative to turnover there had been a declining trend in emissions intensity prior to the 2023-24 inventory.



The reversal of this trend has been due to an increase in fleet emissions between the 2022-23 and 2023-24 inventories. It had been expected that there would be an increase within this category due to the nature of recent acquisitions. Business strategy has focused on the growth of the conditional-monitoring side of the business, and acquisitions made have been of organisations which are primarily service orientated instead of manufacturing orientated. These organisations tend to have lower Scope 2 and Scope 3 emissions but do tend to operate a larger vehicle fleet and cover more distance as a result of attending customer sites.

13 Carbon Reduction Plan

The primary and long-term aim of carrying out an inventory of GHG emissions is to drive down those emissions over time. As previously mentioned, A.E.S has made a strong investment commitment in order to achieve this, a commitment which has spanned the past four years and stands at over £20 million invested in environmental projects by the end of 2024.

This section details the efforts that have been made during previously conducted inventories, and also the efforts that took place during this reporting period.

13.1 Previous Actions

There have been multiple previous actions carried out by A.E.S, this section only concerns those which have an impact upon the Scope 1 & 2 emissions of A.E.S Engineering Ltd. as covered by the scope of this inventory.

The most significant projects are logically focused on the most significant manufacturing sites, these being the largest emitters amongst the group. In particular the head office of Mill Close, UK is the primary manufacturing site for A.E.S products and is responsible for roughly a third of the group's electricity usage. As a result, there has been significant investment at the site.

The rooftop of the site is fully covered in two separate PV Arrays, both of which are accompanied by Battery Energy Storage Systems. The majority of the roof is covered by a *908 kWp* PV array, which feeds nine separate inverters on site for a total of *772 kW* of potential AC generation. This array (and the site at large) is complemented by a *1.2 MWh* battery storage system, this system allows for the storage of excess energy generation by the PV for later use by the site in summer months in order to maximise the percentage of site energy sourced directly from its' own PV array. Furthermore, the battery also carries its own environmental benefits when not needed for excess solar generation. These benefits include nighttime harvesting, the battery is able to take in from the grid at night and release to the site during the day. Doing so provides both a cost saving to the company and an environmental benefit, as the proportion of generation from renewables is highest at night. The unit is also able to offer additional benefits to the local grid in terms of grid-balancing, by charging or discharging in times of need when there is excess or scarce power supply.

In addition, the remainder of the roof is covered by a further *407 kWp* PV array which covers the majority of the roof of the new extension to the site. This array feeds directly into a second *1 MWh* battery storage system which is capable of outputting this energy

to the site at *100 kW* of AC power. This combined system will allow the site to reduce its reliance on the grid even further by fully maximising the proportion of the energy use of the site that is self-generated. A.E.S has undertaken these investments despite the head office already being on a green-tariff, and thus on a market basis these provide no reduction in terms of CO_2e to the group.

Significant expense has also been made with the aim of electrifying the vehicle fleet within the United Kingdom. Electric car chargers have been installed at most major AESSEAL plc and some AVT sites, and all AESSEAL plc pool cars are now electric. This has resulted in a consistent decline in the fleet emissions of AESSEAL plc despite an increase in overall distance covered.

Elsewhere within the UK there have been further works aimed at reducing the location-based emissions of the group. At the smaller site of Mangham Road, Rotherham, this has consisted of an install of a *39 kWp* thin-film PV array capable of generating an approximate *37,000 kWh* of clean energy a year and thus reducing emissions by *7 tonnes* CO_2e.

In the previous reporting period, installation of a 39 kWp PV array took place at the A.E.S site of Mazańcowice in Poland. This installation is expected to generate just under 30,000 kWh of clean energy, this renewable generation is expected to reduce the sites Scope 2 emissions by 8 tonnes and also to provide an environmental benefit to the Polish grid at large through the export of surplus energy to grid.

Elsewhere, at the A.E.S site in Tarragona, a *33.75 kWp* PV array has been installed, which generates almost *50,000 kWh* of energy a year and results in a reduction in annual emissions of *9.4 Tonnes* CO_2e.

13.2 Actions taken within this reporting period

The following actions discussed within this sub-section have either been initiated or have been completed between the 01-10-23 and 30-09-24.

The Pune site in Maharashtra, India is one of the largest CO_2e emitters of the group, largely due to electricity usage at the site. The site provides manufacturing capability for the group and therefore has high energy use and the Indian grid is relatively high in terms of carbon intensity. A project was therefore initiated during the previous reporting period for the install of a *355 kWp* PV array and a supporting *250 kWh* battery storage system. The combined system is expected to remove the vast majority of the sites reliance upon the grid for energy, and thus save almost *300 Tonnes* CO_2e in the process. Furthermore, the battery is also able to act as an uninterrupted power supply for the site, allowing for

further reductions in *CO_2e* from the elimination of diesel usage at the site for generators. Although there were multiple complications identified during the install, the combined system was fully operational from December of 2023.

A similar system is also in place at the site of Rockford, TN, which also acts as a manufacturing site for the group of companies. Installed during the previous reporting period was a *552.2 kWp* PV array capable of producing an expected *778,100 kWh* of clean energy for the site on an annual basis. This is complemented by a *500-kWh* battery storage system which allows for the full generation of the site to be utilised. This combined system is expected to result in a reduction of almost *300 tonnes CO_2e* on a location-basis over a full year. This project was initiated during a previous inventory and final commissioning took place in September of 2024.

There are ongoing works at the UK manufacturing site of Bradford, where a *402 kWp* PV array has been installed. Efforts are ongoing to incorporate a battery energy storage system into the site to support this PV and the site at large, with works expected to start in early 2025.

At the site of Kronau in Germany, installation has taken place of *99.6 kWp* rooftop PV array. This work was carried out during a previous inventory, however due to substantial issues during install this system was not fully commissioned until August of 2024. Over a full year it is expected to prevent the emissions of *15.1 Tonnes CO_2e.* Furthermore, the de-commissioning of the oil heating system was completed at a similar time, with heating now being provided by a mix of electric heating and air source heat pumps.

Works have been ongoing at the Mill Close site to remove all gas heating. The newly constructed expansion to the site utilises entirely electric and passive heating. Works are expected to take place in early 2025 to phase out the use of gas space heating in the older workshop and office areas.

The following table summarises these planned and completed actions with their total reduction in emissions. Also shown are the estimated percentage reduction in relation to the Scope & Category total observed within the previously conducted inventory. Note that at this time, these CO_2e reductions (and corresponding percentages) are estimated values.

Project	Annual CO_2e reduction.	Scope & Category	% of 2022-23 Scope Total
Pune, PV + Battery Storage	300	Scope 2, Purchased Electricity	10.80%
Rockford, PV + Battery Storage	300	Scope 2, Purchased Electricity	10.80%
Kronau, PV	15	Scope 2, Purchased Electricity	0.54%
Kronau, heating change	16	Scope 1, Other Consumed Fuels	14.30%
Mill Close, gas removal	117	Scope 1, Natural Gas	23.37%

14 Offsets & Offsetting Strategy

Whilst emissions reduction efforts are undergoing, A.E.S Engineering Ltd. is still responsible for the production of Scope 1 & 2 emissions. A.E.S will continue to take actions to offset and mitigate its residual Scope 1 & 2 emissions, though at no point will such action be utilised as reasoning to cease investment in emission reduction efforts.

In previous inventories, A.E.S has purchased offsets to counter its Scope 1 & 2 emissions through verified Gold Standard or VERRA projects. For the purposes of this inventory, A.E.S has continued to purchase offsets as well as utilising the environmental benefit of an owned solar farm in India to act against residual emissions. Supporting documents on the A.E.S owned solar farm have been completed and are available to complement this report.

Considering only purchased offsets; projects are purchased with the assistance of Carbon Footprint Ltd:

Carbon Footprint Ltd
Belvedere House
Basing View
Basingstoke
Hampshire
RG21 4HG
Company Number 04532520 / SIC 74901

Aligning to the reporting period of 1st October 2023 to 30th of September 2024, a total of *1750* tonnes of offset credits were purchased:

Credits	Projects	Project Reference	Verification
1750	Offset via improved cookstoves in Nigeria	GS7312	Gold Standard

carbon footprint™

This certificate acknowledges that

AES Engineering Ltd

offset

1,750 Tonnes of Carbon Dioxide

26 September 2024

by supporting the following projects:

Afforestation in Ghana

And planted 175 trees in Kenya

John Buckley, Director
Carbon Footprint Ltd

www.carbonfootprint.com

Offsetting carbon emissions
helping to combat climate change
sustaining the environment for future generations

Appendix – A: Statement of Verification

bsi.

Verification Opinion

Verified as Satisfactory	
Based on the process and procedures conducted, the GHG statement in the GHG Report '28-03-25 - GHG Inventory Report - Engineering 2023-2024' produced by A.E.S Engineering Ltd:	• Is materially correct and is a fair representation of GHG data and information. • Has been prepared in accordance with ISO14064-1:2018 and its principles.
The following improvements were raised in relation to future reporting:	The current methodology for calculating waste emissions uses estimated waste volumes based on receptacle size as the data source. The organisation may wish to consider using data available on waste transfer notes where possible to increase accuracy. This is non-material to overall emissions.
Lead Verifier	Natalie Bavis
Independent Reviewer	Stuart Jamieson
Signed on behalf of BSI	Matt Page, Senior Vice President, Assurance Services, EMEA
Issue Date	08th May 2025
BSI Assurance UK Ltd, Kitemark Court, Davy Avenue, Milton Keynes, MK5 8PP, UK	
NOTE: BSI Assurance UK Ltd is independent to and has no financial interest in A.E.S Engineering Ltd. This 3rd party Verification Opinion has been prepared for A.E.S Engineering Ltd only for the purposes of verifying its statement relating to its GHG emissions more particularly described in the scope above. It was not prepared for any other purpose. In making this Statement, BSI Assurance UK Ltd has assumed that all information provided to it by A.E.S Engineering Ltd is true, accurate and complete. BSI Assurance Ltd accepts no liability to any third party who places reliance on this statement.	

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Verification Engagement

Organization	A.E.S Engineering Ltd
Responsible party	A.E.S Engineering Ltd
Verification Objectives	To express an opinion on whether the organizational GHG Statement which is historical in nature: • Is accurate, materially correct and is a fair representation of GHG data and information • Has been prepared in accordance with ISO14064-1:2018, the criteria used by BSI to verify the GHG Organizational Statement
Materiality Level	5%
Level of Assurance	Reasonable
Verification evidence gathering procedures	• Evaluation of the monitoring and controls systems through interviewing employees observation & inquiry • Verification of the data through sampling recalculation, retracing, cross checking and reconciliation
Verification Standards	The verification was carried out in accordance with ISO 14064-3: 2019, ISO 14065: 2020 and ISO 17029:2019
Note: AES Engineering Ltd. is responsible for the preparation and fair presentation of the GHG statement and report in accordance with the agreed criteria. BSI is responsible for expressing an opinion on the GHG statement based on the verification.	

Confidential

Organizational GHG Statement

Organization		A.E.S Engineering Ltd.
Organizations GHG Report containing GHG Statement		28-03-25 - GHG Inventory Report – AES Engineering 2023-2024
Organizational Boundary		Operational control
Locations included in the Organizational Boundary		See Appendix A
Scope of activities:		Manufacturing, sales and technical service for mechanical seals and support systems.
Reporting Boundary:	Direct GHG Emissions (Scope 1)	Stationary combustion, mobile combustion & refrigerants
	Indirect GHG Emissions from imported energy (Scope 2)	Electricity & heat
	Indirect GHG emissions from transportation (Scope 3)	Upstream & downstream transportation of goods, Commuting & business travel
	Indirect GHG emissions from products used by organization (Scope 3)	Purchased goods & services Capital goods
	Indirect GHG emissions associated with the use of products from the organization (Scope 3)	Use stage & end of life
	Indirect GHG emissions from other sources (scope 3)	Fuel and energy related activities, waste and upstream leased assets
Criteria for developing the organizational GHG Inventory:		ISO14064-1:2018
Reporting Period		1st October 2023 to 30th September 2024

Confidential

Quantification of emissions

Scope	Location Based (t CO2e)	Market Based (t CO2e)
Direct (scope 1)	2548.83	2548.83
Indirect from imported energy (scope 2)	2975.88	1643.94
Indirect other (scope 3)	112,422.62	112,422.62
Total	**117,947.33**	**116,615.40**

Note: A.E.S Engineering Ltd. purchases and retirement of 1750t of CO_2e was verified:

Projects	t CO2e	Verified at
Offset via improved cookstoves in Nigeria (GS7312)	1750	Gold Standard
Total	**1750**	

Appendix – B: Conversion Factors

The following section lists all emissions factors used within this GHG report alongside their source, all emissions factors are listed in kg of CO_2e per unit unless stated otherwise.

Scope 1

The following tables cover all Scope 1 emission sources that have been used within this GHG inventory.

DESNZ, United Kingdom Government - 2024

Factor	kg CO_2e	Per Unit
Natural Gas	2.04542	Cubic metre
Natural Gas	0.18290	kWh
Propane	2997.63	Tonne
Propane	1.54357	Litre
Propane	0.21411	kWh
LPG	2939.36	Tonne
LPG	1.55713	Litre
LPG	0.21450	kWh
Diesel	3203.91	Tonne
Diesel	2.65937	Litre
Diesel	0.25193	kWh
Petrol	3154.08	Tonne
Petrol	2.34503	Litre
Petrol	0.24171	kWh
Fuel Oil	3228.89	Tonne
Fuel Oil	3.17493	Litre
Fuel Oil	0.26814	kWh
R32 - Difluoromethane	677	kg
R22 - Chlorodifluoromethane	1760	kg
Diesel Small car	0.13994	km
Diesel Medium car	0.16807	km
Diesel Large car	0.20729	km
Diesel Average car	0.16984	km
Petrol Small car	0.14370	km
Petrol Medium car	0.17726	km
Petrol Large car	0.26885	km
Petrol Average car	0.16450	km
Hybrid Small car	0.11274	km
Hybrid Medium car	0.11490	km
Hybrid Large car	0.15486	km
Hybrid Average car	0.12607	km

Van - Class I (up to 1.305 tonnes)	0.15356	km
Van - Class II (1.305 to 1.74 tonnes)	0.18832	km
Van - Class III (1.74 to 3.5 tonnes)	0.27365	km
Van - Average (up to 3.5 tonnes)	0.25023	km
Electric	0.00000	km

Scope 2

The following tables cover all Scope 2 emission sources that are relevant to A.E.S Engineering group company, all values are listed as kg CO_2e per kWh unless otherwise stated.

Purchased Electricity

Region	Electricity Emissions Factor (kg/kWh)	Source
Alberta, Canada	0.47009	2024 National Inventory Report, Government of Canada, (2024)
Algeria	0.43000	Energy Profile Algeria, International Renewable Energy Agency, (2024)
Argentina	0.31300	Energy Profile Argentina, International Renewable Energy Agency, (2024)
Austria	0.12200	Energy Profile Austria, International Renewable Energy Agency, (2024)
Botswana	1.77200	Grid Emissions Factors, IGES, (2022)
Brazil	0.07400	Energy Profile Brazil, International Renewable Energy Agency, (2024)
British Colombia, Canada	0.01350	2024 National Inventory Report, Government of Canada, (2024)
Chile	0.35500	Energy Profile Chile, International Renewable Energy Agency, (2024)
China	0.56900	Energy Profile China, International Renewable Energy Agency, (2024)
Colombia	0.17200	Energy Profile Colombia, International Renewable Energy Agency, (2024)
Czechia	0.41300	Energy Profile Czechia, International Renewable Energy Agency, (2024)
Denmark	0.10100	Energy Profile Denmark, International Renewable Energy Agency, (2024)
Finland	0.10100	Energy Profile Finland, International Renewable Energy Agency, (2024)
Florida, United States	0.37046	Emissions Factors for Greenhouse Gas Inventories, EPA, (2024)
France	0.09600	Energy Profile France, International Renewable Energy Agency, (2024)
Germany	0.35800	Energy Profile Germany, International Renewable Energy Agency, (2024)
Illinois, United States	0.45618	Emissions Factors for Greenhouse Gas Inventories, EPA, (2024)
India	0.72749	CO2 Baseline Database Version 20.0, Central Electricity Authority, (2024)
Iowa, United States	0.42789	Emissions Factors for Greenhouse Gas Inventories, EPA, (2024)
Italy	0.31800	Energy Profile Italy, International Renewable Energy Agency, (2024)
Japan	0.47600	Energy Profile Japan, International Renewable Energy Agency, (2024)
Maine, United States	0.24507	Emissions Factors for Greenhouse Gas Inventories, EPA, (2024)
Malaysia	0.70700	Energy Profile Malaysia, International Renewable Energy Agency, (2024)

Mexico	0.34500	Energy Profile Mexico, International Renewable Energy Agency, (2024)
Minnesota, United States	0.42789	Emissions Factors for Greenhouse Gas Inventories, EPA, (2024)
Namibia	0.90200	Energy Profile Namiba, International Renewable Energy Agency, (2024)
Netherlands	0.29300	Energy Profile Netherlands, International Renewable Energy Agency, (2024)
Nevada, United States	0.35348	Emissions Factors for Greenhouse Gas Inventories, EPA, (2024)
New South Wales, Australia	0.66000	National Greenhouse Accounts Factors, DISER, (2024)
Ontario, Canada	0.03500	2024 National Inventory Report, Government of Canada, (2024)
Poland	0.55500	Energy Profile Poland, International Renewable Energy Agency, (2024)
Portugal	0.17400	Energy Profile Portugal, International Renewable Energy Agency, (2024)
Queensland, Australia	0.71000	National Greenhouse Accounts Factors, DISER, (2024)
Republic of Ireland	0.22990	Energy conversion and emission factors, SEAI, (May 2024)
Saudi Arabia	0.60500	Energy Profile Saudi Arabia, International Renewable Energy Agency, (2024)
South Africa	0.90200	Energy Profile South Africa, International Renewable Energy Agency, (2024)
South Australia, Australia	0.23000	National Greenhouse Accounts Factors, DISER, (2024)
Spain	0.21500	Naturgy Iberia S.A, Miteco, (2024)
Sweden	0.03700	Energy Profile Sweden, International Renewable Energy Agency, (2024)
Taiwan	0.49500	Bureau of Energy, Taiwan, (2017)
Tennessee, United States	0.42573	Emissions Factors for Greenhouse Gas Inventories, EPA, (2024)
Texas, United States	0.35123	Emissions Factors for Greenhouse Gas Inventories, EPA, (2024)
Turkey	0.46200	Energy Profile Turkey, International Renewable Energy Agency, (2024)
UAE	0.39790	Sustainability Report 2023, DEWA, (2024)
United Kingdom	0.20705	UK Government GHG Conversion Factors for Company Reporting, DESNZ, (2024)
Uruguay	0.05100	Energy Profile Uruguay, International Renewable Energy Agency, (2024)
Washington, United States	0.27478	Emissions Factors for Greenhouse Gas Inventories, EPA, (2024)
Western Australia, Australia	0.51000	National Greenhouse Accounts Factors, DISER, (2024)

Purchased Heat

Site	kg CO_2e per kWh	Source
ProPack	0.014	McCay, Feliks & Roberts (2019)
Benelux	0.11807	Ennatuurlijk, (2024)

Scope 3

Categories 1, 2 and 4: - Background:

Emissions associated with the supply chain are particularly difficult to assess, one of the most significant categories of Scope 3 emissions is category 1, purchased goods and services. These are the emissions that you are responsible for as a purchaser and consumer of these items.

However, tools and methods for calculating the impact from scope 3 category 1 are not widely available and are often out of date or poorly put together. Emissions factors for fuel use or electricity use are easy to grasp, however calculating the environmental impact of purchasing an item is much more complex.

Working out the environmental impact of purchasing an item takes data from two sources, the total emissions of industry sectors, and an input-output table for an economy. This second source is where complexity is introduced.

If an industry simply produced goods and sold these to customers, we could simply take the industries emissions and divide them by the value of the goods sold. By doing so we could then work out how much emissions a customer is responsible for due to purchasing goods from this industry.

However, the world is not this simple and industries will supply to each other, to other businesses in the same industry, to industries in other countries, all before goods end up arriving to the end user. As a result of this, we need to consider all the different 'layers' that occur before a product ends up being purchased by the consumer. This data is recorded in the input-output table.

As the input-output table is a huge amount of data to gather, regular published databases are not available. The World Input-Output Database (WIOD) compiled this data up until 2011 and was released in April of 2013. To go alongside this information, the European Union published a set of environmental accounts which records the emissions of various sectors in different countries that matches those seen in the WIOD, however this information was only collected up until 2009.

The process of assigning these emissions to the end product of these industries is called Environmentally Extended Input-Output (*An Introduction to Environmentally-Extended Input-Output Analysis. Kitzes, J. Energy and Resources Group, University of California, 2013.*).

The input-output tables take the form of a square matrix with the sectors as the rows and columns, the inputs to each sector are in the columns and the outputs to each sector are in the rows.

The WIOD tables display this information for *35* sectors in *41* regions to produce a core square matrix of *2464 x 2464*. Accompanying this are the environmental accounts, this displays the CO_2e emissions of the same industry sectors and regions as seen in the WIOD report.

The first step is to simply perform an element-wise division of the total emissions [E] of a sector by its total output [O] :

$$f = [E]/[O]$$

This involves dividing each single value in the column vector containing the total sector emissions by the corresponding value in the total output column.

What is needed next is to calculate the technical coefficient matrix, *A.* This shows the amount of input a given sector must receive from others to create a single unit of output. This matrix may be derived by again performing an element-wise division of each column of the input-output table by the total output of that sector.

```
For each column in WIOD:
  For each row in WIOD:
    A(row, column) = WIOD(row, column)/Output(row)
  End
End
```

This means dividing each value in the first column of the WIOD table by the corresponding value in the total output column, and then repeating this process for every column within the WIOD table. The end product is another matrix, *A,* which is the same size as the WIOD matrix.

Finally, what is needed is the Total Intensity Vector, F. This is the sum of each intensity vector for every 'layer' of supply:

$$F = F_1 + F_2 + F_3 \ldots.$$

$$F = f[I + A + A^2 + \cdots]$$

These brackets form a geometric series whose sum may be expressed as $(I - A)^{-1}$, where *I* is the identity matrix. The identity matrix being a matrix made up of zeros with the exception of the leading diagonal, whose elements are all equal to one. This is then referred to as *L,* the *Leontief inverse matrix*:

$$F = fL = f(I - A)^{-1}$$

The end result is a column vector displaying the CO_2e emissions per unit dollar of output for that sector and region.

In terms of calculating this, what is first needed is to perform a subtraction of *A* from the identity matrix of the same size. The resultant matrix may then be inversed to produce the *Leontief inverse matrix, L:*

$$L = \left[\begin{bmatrix} 1 & 0 & \dots \\ 0 & 1 & \dots \\ \dots & \dots & \dots \end{bmatrix} - \begin{bmatrix} A_{11} & A_{12} & \dots \\ A_{21} & A_{22} & \dots \\ \dots & \dots & \dots \end{bmatrix}\right]^{-1}$$

This may finally be multiplied by the earlier derived vector, *f*.

$$F = fL$$

This final result is a column vector displaying the CO_2e emissions per unit dollar of output for that sector and region. The calculations discussed above have been conducted within *MATLAB*.

These factors may be applied to the dollar spend in each respective sector and region to calculate the emissions impact of the purchased amount of goods.

References	
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Categories 1, 2 and 4: - Emissions Factors:

All emissions factors listed below are sourced from the WIOD database (2013).

Country	Industry Sector	CO_2e kg/$/yr
Australia	Food, Beverages and Tobacco	1.050
Australia	Textiles and Textile Products	0.685
Australia	Wood and Products of Wood and Cork	0.657
Australia	Pulp, Paper, Paper , Printing and Publishing	0.441
Australia	Chemicals and Chemical Products	1.034

Australia	Rubber and Plastics	0.561
Australia	Other Non-Metallic Mineral	1.599
Australia	Basic Metals and Fabricated Metal	1.083
Australia	Machinery, Nec	0.587
Australia	Electrical and Optical Equipment	0.465
Australia	Transport Equipment	0.484
Australia	Manufacturing, Nec; Recycling	0.554
Australia	Electricity, Gas and Water Supply	5.660
Australia	Construction	0.454
Australia	Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles	0.321
Australia	Hotels and Restaurants	0.496
Australia	Inland Transport	0.639
Australia	Water Transport	2.330
Australia	Air Transport	1.699
Australia	Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies	0.473
Australia	Post and Telecommunications	0.374
Australia	Health and Social Work	0.166
Brazil	Food, Beverages and Tobacco	1.863
Brazil	Textiles and Textile Products	0.446
Brazil	Wood and Products of Wood and Cork	0.850
Brazil	Pulp, Paper, Paper , Printing and Publishing	0.652
Brazil	Chemicals and Chemical Products	0.612
Brazil	Rubber and Plastics	0.426
Brazil	Other Non-Metallic Mineral	1.296
Brazil	Basic Metals and Fabricated Metal	0.704
Brazil	Machinery, Nec	0.364
Brazil	Electrical and Optical Equipment	0.374
Brazil	Transport Equipment	0.330
Brazil	Manufacturing, Nec; Recycling	0.375
Brazil	Electricity, Gas and Water Supply	0.432
Brazil	Construction	0.359
Brazil	Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles	0.124
Brazil	Hotels and Restaurants	0.754
Brazil	Inland Transport	0.656
Brazil	Water Transport	1.834
Brazil	Air Transport	0.711
Brazil	Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies	0.316
Brazil	Post and Telecommunications	0.286
Brazil	Health and Social Work	0.227
Canada	Food, Beverages and Tobacco	0.731
Canada	Textiles and Textile Products	0.456
Canada	Wood and Products of Wood and Cork	0.852

Canada	Pulp, Paper, Paper Printing and Publishing	0.460
Canada	Chemicals and Chemical Products	0.957
Canada	Rubber and Plastics	0.519
Canada	Other Non-Metallic Mineral	1.180
Canada	Basic Metals and Fabricated Metal	0.822
Canada	Machinery, Nec	0.411
Canada	Electrical and Optical Equipment	0.418
Canada	Transport Equipment	0.382
Canada	Manufacturing, Nec; Recycling	0.455
Canada	Electricity, Gas and Water Supply	2.550
Canada	Construction	0.471
Canada	Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles	0.265
Canada	Hotels and Restaurants	0.384
Canada	Inland Transport	0.851
Canada	Water Transport	2.465
Canada	Air Transport	2.255
Canada	Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies	0.318
Canada	Post and Telecommunications	0.364
Canada	Health and Social Work	0.231
China	Food, Beverages and Tobacco	1.649
China	Textiles and Textile Products	1.518
China	Wood and Products of Wood and Cork	1.652
China	Pulp, Paper, Paper , Printing and Publishing	1.753
China	Chemicals and Chemical Products	2.549
China	Rubber and Plastics	1.903
China	Other Non-Metallic Mineral	4.158
China	Basic Metals and Fabricated Metal	2.726
China	Machinery, Nec	1.682
China	Electrical and Optical Equipment	1.404
China	Transport Equipment	1.419
China	Manufacturing, Nec; Recycling	1.302
China	Electricity, Gas and Water Supply	11.148
China	Construction	2.015
China	Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles	0.598
China	Hotels and Restaurants	1.309
China	Inland Transport	1.313
China	Water Transport	1.974
China	Air Transport	3.193
China	Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies	1.320
China	Post and Telecommunications	0.662
China	Health and Social Work	1.471
France	Food, Beverages and Tobacco	0.563

France	Textiles and Textile Products	0.218
France	Wood and Products of Wood and Cork	0.510
France	Pulp, Paper, Paper , Printing and Publishing	0.234
France	Chemicals and Chemical Products	0.430
France	Rubber and Plastics	0.301
France	Other Non-Metallic Mineral	0.856
France	Basic Metals and Fabricated Metal	0.385
France	Machinery, Nec	0.216
France	Electrical and Optical Equipment	0.251
France	Transport Equipment	0.254
France	Manufacturing, Nec; Recycling	0.369
France	Electricity, Gas and Water Supply	0.656
France	Construction	0.193
France	Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles	0.122
France	Hotels and Restaurants	0.206
France	Inland Transport	0.389
France	Water Transport	0.436
France	Air Transport	1.491
France	Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies	0.104
France	Post and Telecommunications	0.080
France	Health and Social Work	0.063
Spain	Food, Beverages and Tobacco	0.507
Spain	Textiles and Textile Products	0.383
Spain	Wood and Products of Wood and Cork	0.375
Spain	Pulp, Paper, Paper , Printing and Publishing	0.342
Spain	Chemicals and Chemical Products	0.483
Spain	Rubber and Plastics	0.351
Spain	Other Non-Metallic Mineral	1.341
Spain	Basic Metals and Fabricated Metal	0.452
Spain	Machinery, Nec	0.277
Spain	Electrical and Optical Equipment	0.311
Spain	Transport Equipment	0.307
Spain	Manufacturing, Nec; Recycling	0.289
Spain	Electricity, Gas and Water Supply	1.277
Spain	Construction	0.247
Spain	Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles	0.170
Spain	Hotels and Restaurants	0.165
Spain	Inland Transport	0.535
Spain	Water Transport	0.952
Spain	Air Transport	1.092
Spain	Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies	0.274
Spain	Post and Telecommunications	0.157

Spain	Health and Social Work	0.132
United States of America (the)	Food, Beverages and Tobacco	1.011
United States of America (the)	Textiles and Textile Products	0.624
United States of America (the)	Wood and Products of Wood and Cork	0.994
United States of America (the)	Pulp, Paper, Paper , Printing and Publishing	0.532
United States of America (the)	Chemicals and Chemical Products	0.827
United States of America (the)	Rubber and Plastics	0.600
United States of America (the)	Other Non-Metallic Mineral	1.924
United States of America (the)	Basic Metals and Fabricated Metal	0.762
United States of America (the)	Machinery, Nec	0.412
United States of America (the)	Electrical and Optical Equipment	0.259
United States of America (the)	Transport Equipment	0.437
United States of America (the)	Manufacturing, Nec; Recycling	0.397
United States of America (the)	Electricity, Gas and Water Supply	5.639
United States of America (the)	Construction	0.375
United States of America (the)	Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles	0.105
United States of America (the)	Hotels and Restaurants	0.389
United States of America (the)	Inland Transport	1.010
United States of America (the)	Water Transport	2.073
United States of America (the)	Air Transport	1.508
United States of America (the)	Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies	0.473
United States of America (the)	Post and Telecommunications	0.216
United States of America (the)	Health and Social Work	0.192
India	Food, Beverages and Tobacco	2.567
India	Textiles and Textile Products	1.854
India	Wood and Products of Wood and Cork	2.720
India	Pulp, Paper, Paper , Printing and Publishing	2.241
India	Chemicals and Chemical Products	2.261
India	Rubber and Plastics	2.029
India	Other Non-Metallic Mineral	4.937
India	Basic Metals and Fabricated Metal	3.279
India	Machinery, Nec	1.663
India	Electrical and Optical Equipment	1.457
India	Transport Equipment	1.840
India	Manufacturing, Nec; Recycling	1.095
India	Electricity, Gas and Water Supply	16.896
India	Construction	1.680
India	Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles	0.157
India	Hotels and Restaurants	1.977
India	Inland Transport	1.429
India	Water Transport	2.649
India	Air Transport	1.669

India	Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies	1.716
India	Post and Telecommunications	0.913
India	Health and Social Work	0.631
Rest Of World	Food, Beverages and Tobacco	1.405
Rest Of World	Textiles and Textile Products	0.945
Rest Of World	Wood and Products of Wood and Cork	0.991
Rest Of World	Pulp, Paper, Paper , Printing and Publishing	0.705
Rest Of World	Chemicals and Chemical Products	1.640
Rest Of World	Rubber and Plastics	3.168
Rest Of World	Other Non-Metallic Mineral	2.728
Rest Of World	Basic Metals and Fabricated Metal	1.143
Rest Of World	Machinery, Nec	0.728
Rest Of World	Electrical and Optical Equipment	0.774
Rest Of World	Transport Equipment	0.586
Rest Of World	Manufacturing, Nec; Recycling	1.844
Rest Of World	Electricity, Gas and Water Supply	4.687
Rest Of World	Construction	0.816
Rest Of World	Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles	0.386
Rest Of World	Hotels and Restaurants	0.999
Rest Of World	Inland Transport	0.980
Rest Of World	Water Transport	3.164
Rest Of World	Air Transport	2.848
Rest Of World	Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies	0.865
Rest Of World	Post and Telecommunications	0.438
Rest Of World	Health and Social Work	0.685
United Kingdom	Food, Beverages and Tobacco	0.530
United Kingdom	Textiles and Textile Products	0.375
United Kingdom	Wood and Products of Wood and Cork	0.407
United Kingdom	Pulp, Paper, Paper , Printing and Publishing	0.276
United Kingdom	Chemicals and Chemical Products	0.481
United Kingdom	Rubber and Plastics	0.405
United Kingdom	Other Non-Metallic Mineral	0.974
United Kingdom	Basic Metals and Fabricated Metal	0.717
United Kingdom	Machinery, Nec	0.332
United Kingdom	Electrical and Optical Equipment	0.290
United Kingdom	Transport Equipment	0.340
United Kingdom	Manufacturing, Nec; Recycling	0.361
United Kingdom	Electricity, Gas and Water Supply	2.032
United Kingdom	Construction	0.216
United Kingdom	Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles	0.158
United Kingdom	Hotels and Restaurants	0.236
United Kingdom	Inland Transport	0.455

United Kingdom	Water Transport	1.648
United Kingdom	Air Transport	3.329
United Kingdom	Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies	0.124
United Kingdom	Post and Telecommunications	0.174
United Kingdom	Health and Social Work	0.184
Worldwide Average	Food, Beverages and Tobacco	1.116
Worldwide Average	Textiles and Textile Products	1.096
Worldwide Average	Wood and Products of Wood and Cork	1.059
Worldwide Average	Pulp, Paper, Paper , Printing and Publishing	0.698
Worldwide Average	Chemicals and Chemical Products	1.321
Worldwide Average	Rubber and Plastics	1.235
Worldwide Average	Other Non-Metallic Mineral	2.805
Worldwide Average	Basic Metals and Fabricated Metal	1.532
Worldwide Average	Machinery, Nec	0.816
Worldwide Average	Electrical and Optical Equipment	0.807
Worldwide Average	Transport Equipment	0.610
Worldwide Average	Manufacturing, Nec; Recycling	0.775
Worldwide Average	Electricity, Gas and Water Supply	5.099
Worldwide Average	Construction	0.790
Worldwide Average	Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles	0.275
Worldwide Average	Hotels and Restaurants	0.548
Worldwide Average	Inland Transport	0.920
Worldwide Average	Water Transport	1.998
Worldwide Average	Air Transport	1.914
Worldwide Average	Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies	0.522
Worldwide Average	Post and Telecommunications	0.297
Worldwide Average	Health and Social Work	0.298
Poland	Food, Beverages and Tobacco	1.107
Poland	Textiles and Textile Products	0.587
Poland	Wood and Products of Wood and Cork	0.938
Poland	Pulp, Paper, Paper , Printing and Publishing	0.634
Poland	Chemicals and Chemical Products	1.751
Poland	Rubber and Plastics	0.716
Poland	Other Non-Metallic Mineral	2.072
Poland	Basic Metals and Fabricated Metal	1.168
Poland	Machinery, Nec	0.558
Poland	Electrical and Optical Equipment	0.575
Poland	Transport Equipment	0.549
Poland	Manufacturing, Nec; Recycling	0.621
Poland	Electricity, Gas and Water Supply	5.242
Poland	Construction	0.547
Poland	Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles	0.386

Poland	Hotels and Restaurants	0.581
Poland	Inland Transport	1.118
Poland	Water Transport	0.594
Poland	Air Transport	2.185
Poland	Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies	0.623
Poland	Post and Telecommunications	0.275
Poland	Health and Social Work	0.431
Germany	Food, Beverages and Tobacco	0.637
Germany	Textiles and Textile Products	0.409
Germany	Wood and Products of Wood and Cork	0.503
Germany	Pulp, Paper, Paper , Printing and Publishing	0.338
Germany	Chemicals and Chemical Products	0.565
Germany	Rubber and Plastics	0.365
Germany	Other Non-Metallic Mineral	1.164
Germany	Basic Metals and Fabricated Metal	0.621
Germany	Machinery, Nec	0.285
Germany	Electrical and Optical Equipment	0.286
Germany	Transport Equipment	0.325
Germany	Manufacturing, Nec; Recycling	0.309
Germany	Electricity, Gas and Water Supply	2.383
Germany	Construction	0.278
Germany	Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles	0.158
Germany	Hotels and Restaurants	0.241
Germany	Inland Transport	0.312
Germany	Water Transport	0.352
Germany	Air Transport	1.257
Germany	Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies	0.305
Germany	Post and Telecommunications	0.205
Germany	Health and Social Work	0.136

Category 3: DESNZ - 2024 - United Kingdom:

Factor	Well-to-tank kg CO_2e	Per Unit
Natural Gas	0.33660	Cubic metre
Natural Gas	0.03021	kWh
Propane	352.670	Tonne
Propane	0.18046	Litre
Propane	0.02519	kWh
LPG	349.293	Tonne
LPG	0.18551	Litre
LPG	0.02548	kWh
Diesel	752.028	Tonne
Diesel	0.62409	Litre

Diesel	0.05913	kWh
Petrol	815.935	Tonne
Petrol	0.60664	Litre
Petrol	0.06253	kWh
Fuel Oil	714.865	Tonne
Fuel Oil	0.69539	Litre
Fuel Oil	0.05913	kWh
Diesel Small car	0.03409	km
Diesel Medium car	0.04103	km
Diesel Large car	0.05070	km
Diesel Average car	0.04146	km
Petrol Small car	0.04015	km
Petrol Medium car	0.04957	km
Petrol Large car	0.07528	km
Petrol Average car	0.04599	km
Hybrid Small car	0.03026	km
Hybrid Medium car	0.02998	km
Hybrid Large car	0.03961	km
Hybrid Average car	0.03315	km
Van - Class I (up to 1.305 tonnes)	0.03746	km
Van - Class II (1.305 to 1.74 tonnes)	0.04602	km
Van - Class III (1.74 to 3.5 tonnes)	0.06706	km
Van - Average (up to 3.5 tonnes)	0.06128	km
Electric	0.00000	km

Category 3: Purchased Electricity:

Country	kg CO_2e per kWh	Unit	Source
United Kingdom	0.01830	Transmission & Distribution	UK Government GHG Conversion Factors for Company Reporting, DESNZ, (2024)
United Kingdom	0.04590	Well-to-tank Generation	UK Government GHG Conversion Factors for Company Reporting, DESNZ, (2024)
United Kingdom	0.00397	Well-to-tank Transmission & Distribution	UK Government GHG Conversion Factors for Company Reporting, DESNZ, (2024)
Australia	0.17557	Well-to-tank Generation	DESNZ, (2022)
Austria	0.04869	Well-to-tank Generation	DESNZ, (2022)
Brazil	0.01322	Well-to-tank Generation	DESNZ, (2022)
Canada	0.03268	Well-to-tank Generation	DESNZ, (2022)
Czech Republic	0.12477	Well-to-tank Generation	DESNZ, (2022)
Denmark	0.05307	Well-to-tank Generation	DESNZ, (2022)
Finland	0.03719	Well-to-tank Generation	DESNZ, (2022)
France	0.00765	Well-to-tank Generation	DESNZ, (2022)

Germany	0.10427	Well-to-tank Generation	DESNZ, (2022)
India	0.16748	Well-to-tank Generation	DESNZ, (2022)
Ireland	0.07267	Well-to-tank Generation	DESNZ, (2022)
Italy	0.08745	Well-to-tank Generation	DESNZ, (2022)
Malaysia	0.15407	Well-to-tank Generation	DESNZ, (2022)
Mexico	0.09889	Well-to-tank Generation	DESNZ, (2022)
Netherlands	0.07870	Well-to-tank Generation	DESNZ, (2022)
People's Rep. of China	0.16387	Well-to-tank Generation	DESNZ, (2022)
Poland	0.17082	Well-to-tank Generation	DESNZ, (2022)
Portugal	0.05198	Well-to-tank Generation	DESNZ, (2022)
Saudi Arabia	0.17160	Well-to-tank Generation	DESNZ, (2022)
South Africa	0.17814	Well-to-tank Generation	DESNZ, (2022)
Spain	0.06070	Well-to-tank Generation	DESNZ, (2022)
Sweden	0.00246	Well-to-tank Generation	DESNZ, (2022)
Turkey	0.10266	Well-to-tank Generation	DESNZ, (2022)
United States	0.10657	Well-to-tank Generation	DESNZ, (2022)
Non-OECD Europe and Eurasia (average)	0.10279	Well-to-tank Generation	DESNZ, (2022)
Australia	0.01104	Well-to-tank Transmission & Distribution	DESNZ, (2022)
Austria	0.00267	Well-to-tank Transmission & Distribution	DESNZ, (2022)
Brazil	0.00255	Well-to-tank Transmission & Distribution	DESNZ, (2022)
Canada	0.00213	Well-to-tank Transmission & Distribution	DESNZ, (2022)
Czech Republic	0.00918	Well-to-tank Transmission & Distribution	DESNZ, (2022)
Denmark	0.00376	Well-to-tank Transmission & Distribution	DESNZ, (2022)
Finland	0.00136	Well-to-tank Transmission & Distribution	DESNZ, (2022)
France	0.00067	Well-to-tank Transmission & Distribution	DESNZ, (2022)
Germany	0.00542	Well-to-tank Transmission & Distribution	DESNZ, (2022)
India	0.03763	Well-to-tank Transmission & Distribution	DESNZ, (2022)
Ireland	0.00598	Well-to-tank Transmission & Distribution	DESNZ, (2022)
Italy	0.00537	Well-to-tank Transmission & Distribution	DESNZ, (2022)
Malaysia	0.01184	Well-to-tank Transmission & Distribution	DESNZ, (2022)
Mexico	0.01638	Well-to-tank Transmission & Distribution	DESNZ, (2022)
Netherlands	0.00389	Well-to-tank Transmission & Distribution	DESNZ, (2022)
People's Rep. of China	0.00912	Well-to-tank Transmission & Distribution	DESNZ, (2022)
Poland	0.01082	Well-to-tank Transmission & Distribution	DESNZ, (2022)
Portugal	0.00548	Well-to-tank Transmission & Distribution	DESNZ, (2022)
Saudi Arabia	0.01843	Well-to-tank Transmission & Distribution	DESNZ, (2022)
South Africa	0.01972	Well-to-tank Transmission & Distribution	DESNZ, (2022)
Spain	0.00647	Well-to-tank Transmission & Distribution	DESNZ, (2022)
Sweden	0.00020	Well-to-tank Transmission & Distribution	DESNZ, (2022)
Turkey	0.01274	Well-to-tank Transmission & Distribution	DESNZ, (2022)

United States	0.00577	Well-to-tank Transmission & Distribution	DESNZ, (2022)
Non-OECD Europe and Eurasia (average)	0.01359	Well-to-tank Transmission & Distribution	DESNZ, (2022)
Australia	0.07000	Transmission & Distribution	National Greenhouse Accounts Factors, DISER, (2024)
Netherlands	5.00%	Gross Grid Loss	World Bank
Canada – Ontario	0.003	Transmission & Distribution	2024 National Inventory Report, Government of Canada, (2024)
Canada – British Columbia	0.001	Transmission & Distribution	2024 National Inventory Report, Government of Canada, (2024)
China	5.00%	Gross Grid Loss	World Bank
India	19.00%	Gross Grid Loss	World Bank
Colombia	11.00%	Gross Grid Loss	World Bank
Denmark	6.00%	Gross Grid Loss	World Bank
France	6.00%	Gross Grid Loss	World Bank
Germany	4.50%	Gross Grid Loss	World Bank
Spain	9.60%	Gross Grid Loss	World Bank
America - Eastern	5.40%	Gross Grid Loss	Emissions Factors for Greenhouse Gas Inventories, EPA, (2024)
America - Western	5.30%	Gross Grid Loss	Emissions Factors for Greenhouse Gas Inventories, EPA, (2024)
Ireland	4.50%	Gross Grid Loss	World Bank
Italy	4.50%	Gross Grid Loss	World Bank
Mexico	14.00%	Gross Grid Loss	World Bank
UAE	3.30%	Gross Grid Loss	World Bank
Sweden	5.00%	Gross Grid Loss	World Bank
Poland	6.00%	Gross Grid Loss	World Bank
South Africa	8.00%	Gross Grid Loss	World Bank
Taiwan	3.53%	Gross Grid Loss	Taiwan Power Company
Turkey	15.00%	Gross Grid Loss	World Bank
Portugal	10.00%	Gross Grid Loss	World Bank
Japan	4.00%	Gross Grid Loss	World Bank

Category 5:

This section concerns emissions factors used within this report for the purposes of calculating emissions due to produced waste, all emissions factors are in kg CO_2e per metric tonne unless otherwise stated.

Factor	kg CO_2e	Source
Wood - Recycling	6.4106	DESNZ, (2024)
Metal: scrap metal - Recycling	6.4106	DESNZ, (2024)
WEEE - mixed - Recycling	6.4106	DESNZ, (2024)
Paper and board: mixed - Recycling	6.4106	DESNZ, (2024)
Household residual waste - Landfill	497.045	DESNZ, (2024)

Commercial and industrial waste - Landfill	520.334	DESNZ, (2024)
Commercial and industrial waste - Recycling	6.4106	DESNZ, (2024)
Wood - Landfill	925.245	DESNZ, (2024)
Metal: scrap metal - Landfill	8.88386	DESNZ, (2024)
WEEE - mixed - Landfill	8.88386	DESNZ, (2024)
Paper and board: mixed - Landfill	1164.39	DESNZ, (2024)

Category 6:

This section concerns emissions factors used within this report for the purposes of calculating emissions due to business travel. Do note that some emissions factors from Scope 1 for vehicles have also been used for calculation of category 6 emissions, those listed below are additional.

DESNZ - 2024 - United Kingdom

Factor	kg CO_2e	Per Unit
Domestic, to/from UK	0.27257	passenger.km
Short-haul, to/from UK	0.18592	passenger.km
Long-haul, to/from UK	0.26128	passenger.km
International, to/from non-UK	0.17580	passenger.km
Regular taxi	0.14861	passenger.km
Black Cab	0.20402	passenger.km
National rail	0.03546	passenger.km
International rail	0.00446	passenger.km
Light rail and tram	0.02860	passenger.km
London Underground	0.02780	passenger.km
Hotel stay - UK	10.4	Room per night
Hotel stay - UK (London)	11.5	Room per night
Hotel stay - Australia	35	Room per night
Hotel stay - Belgium	12.2	Room per night
Hotel stay - Brazil	8.7	Room per night
Hotel stay - Canada	7.4	Room per night
Hotel stay - Chile	27.6	Room per night
Hotel stay - China	53.5	Room per night
Hotel stay - Colombia	14.7	Room per night
Hotel stay - Costa Rica	4.7	Room per night
Hotel stay - Egypt	44.2	Room per night
Hotel stay - France	6.7	Room per night
Hotel stay - Germany	13.2	Room per night
Hotel stay - Hong Kong, China	51.5	Room per night
Hotel stay - India	58.9	Room per night
Hotel stay - Indonesia	62.7	Room per night

Hotel stay - Italy	14.3	Room per night
Hotel stay - Japan	39	Room per night
Hotel stay - Jordan	68.9	Room per night
Hotel stay - Korea	55.8	Room per night
Hotel stay - Malaysia	61.5	Room per night
Hotel stay - Maldives	152.2	Room per night
Hotel stay - Mexico	19.3	Room per night
Hotel stay - Netherlands	14.8	Room per night
Hotel stay - Oman	90.3	Room per night
Hotel stay - Philippines	54.3	Room per night
Hotel stay - Portugal	19	Room per night
Hotel stay - Qatar	86.2	Room per night
Hotel stay - Russian Federation	24.2	Room per night
Hotel stay - Saudi Arabia	106.4	Room per night
Hotel stay - Singapore	24.5	Room per night
Hotel stay - South Africa	51.4	Room per night
Hotel stay - Spain	7	Room per night
Hotel stay - Switzerland	6.6	Room per night
Hotel stay - Thailand	43.4	Room per night
Hotel stay - Turkey	32.1	Room per night
Hotel stay - United Arab Emirates	63.8	Room per night
Hotel stay - United States	16.1	Room per night
Hotel stay - Vietnam	38.5	Room per night

Category 7:

This section concerns emissions factors used within this report for the purposes of calculating emissions due to employee commuting. Note that emissions factors listed previously for distance-based travel are frequently used for calculations within this category, those factors listed below are additional.

Factor	kg CO_2e per passenger.km	Source
Motorbike - Average	0.11367	DESNZ, (2024)
Local bus (not London)	0.12999	DESNZ, (2024)
Local London bus	0.07447	DESNZ, (2024)
Average local bus	0.10846	DESNZ, (2024)
Coach	0.02717	DESNZ, (2024)

Categories 4 and 9:

This section concerns emissions factors used within this report for the purposes of distance and weight based calculations for purchased logistics.

Factor	kg CO_2e per tonne.km	Source

Rigid (>3.5 - 7.5 tonnes)	0.60195	DESNZ, (2024)
Rigid (>7.5 tonnes-17 tonnes)	0.45287	DESNZ, (2024)
Rigid (>17 tonnes)	0.18330	DESNZ, (2024)
All rigids	0.21254	DESNZ, (2024)
Articulated (>3.5 - 33t)	0.13086	DESNZ, (2024)
Articulated (>33t)	0.08617	DESNZ, (2024)
All artics	0.08732	DESNZ, (2024)
All HGVs	0.11417	DESNZ, (2024)
Freight flights - Domestic, to/from UK	4.67340	DESNZ, (2024)
Freight flights - Short-haul, to/from UK	1.66816	DESNZ, (2024)
Freight flights - Long-haul, to/from UK	1.09904	DESNZ, (2024)
Freight flights - Freight Flight, International, to/from non-UK	1.09904	DESNZ, (2024)
Container ship - 8000+ TEU	0.01265	DESNZ, (2024)
Container ship - 5000–7999 TEU	0.01681	DESNZ, (2024)
Container ship - 3000–4999 TEU	0.01681	DESNZ, (2024)
Container ship - 2000–2999 TEU	0.02025	DESNZ, (2024)
Container ship - 1000–1999 TEU	0.03250	DESNZ, (2024)
Container ship - 0–999 TEU	0.03675	DESNZ, (2024)
Container ship - Average (Container Ship)	0.01612	DESNZ, (2024)

Category 11:

This section concerns emissions factors used within this report for the purposes of calculating emissions from sold product, note that this is a ‘custom’ emissions factors comprised of an average of selected emissions factors from within scope 2.

Factor	kg CO_2e per kWh	Source
Electricity Generation	0.56847	Custom

Category 12:

This section concerns emissions factors used within this report for the purposes of calculating emissions due to produced waste, all emissions factors are in kg CO_2e per tonne unless otherwise stated.

Factor	kg CO_2e	Source
Metal: scrap metal - Recycling	8.8839	DESNZ, (2024)
Commercial and industrial waste - Landfill	520.334	DESNZ, (2024)

Appendix – C: Site Locations

The following site locations are included within this report and the primary entity which operates there, do note that there are certain sites out of which multiple entities operate, or employees from multiple entities are based at and that this list is not an exhaustive list of all entities that fall within this inventory.

Entity	Site (Shorthand)	Address
AESSEAL plc (02101607)	Mill Close	Rotherham - Mill Close, Bradmarsh Business Park, Rotherham, S60 1BZ
AESSEAL plc (02101607)	Derby	Derby - Wetherby Road, Osmaston Park Ind Est, Derby, DE24 8HL
AESSEAL plc (02101607)	Bradford	Bradford - Unit 1 and Unit 2 Venlo Ind Est, Knowles Street, Bradford, BD4 6HE
AESSEAL plc (02101607)	Mangham Road	Mangham Road, Barbot Hall Ind Est, Rotherham, S61 4RJ
AESSEAL plc (02101607)	NE	Middlesborough - Trident House, 1st Floor RHS Falcon Court, Preston Farm Business Park, Stockton-on-Tees, TS18 3TX
AESSEAL plc (02101607)	SE	Essex - 11 Saxon House, Upminster Trading Park, Warley Street,Upminster, Essex RM14 3PJ
AESSEAL (MCK) LTD. (NI017307)	Lisburn	Lisburn - 139A Hillsborough Old Rd, Lisburn, County Antrim BT27 5QE
AESSEAL IRELAND LTD (NI065308)	Cork	Cork - Unit 14, Knockgriffin Ind. Park, Midleton, County Cork, P25 AR23
AVT (UK)	Warrington	Warrington - Unit 2 Easter Court, Europa Boulevard, Warrington, WA5 7ZB
AVT (UK)	Kirkcaldy	Evans John Smith Business Park, Kirkcaldy, KY2 6HD
JaTech	JaTech	JaTech Services - 801 Upper Canada Dr, Sarnia, ON N7W 1A3, Canada
AVT (UK)	Gloucester	Gloucester - Unit 5, Centurion Industrial Estate, Empire Way, Gloucester , GL2 5HY
AVT (UK)	Grangemouth	Grangemouth - Central England Workshop, North Site, Earls Road, Grangemouth, FK3 8XG
VULCAN ENGINEERING LIMITED (02422728)	Vulcan Sheffield	Southwest Centre, The South West Centre, Unit 3 Troutbeck Rd, Sheffield S8 0JR
VULCAN ENGINEERING LIMITED (02422728)	Vulcan Minnesota	Vulcan Seals Inc., 11401-11481 Rupp Drive, Burnsville, Minnesota, MN 55337
VULCAN ENGINEERING LIMITED (02422728)	Eastern Seals	Unit 3, Sovereign Business Park, Jubilee Industrial Estate, Ashington NE63 8UG
VULCAN ENGINEERING	Coating Centre	Unit 10 Eastover Farm, Abbotts Ann, Andover, UK, SP11 7BT

LIMITED (02422728)		
VULCAN ENGINEERING LIMITED (02422728)	Houston TX	7221 N. Gessner Rd, Houston, TX, 77040
AESSEAL Inc.	Rockford	Rockford TN - 355 Dunavant Drive, Rockford Tennessee 37853
AESSEAL Inc.	Kingsport TN	Kingsport TN - Building 226 Dr 6, Eastman Road, Kingsport, Tennessee 37662 (AES employees on Eastman Site)
AESSEAL Inc.	Cedar Rapids IA	616 12th Ave. SW, Warehouse, Cedar Rapids IA 52404
AESSEAL Inc.	Fairfield ME	Fairfield ME - 11 Evergreen Drive, Fairfield, Maine, 04937
AESSEAL Inc.	Longview WA	Longview WA - Suite #8, 960 Industrial Way, Longview, WA 98632
Mechanical Seal & Service Inc.	Odessa TX	Odessa - 3500 N County Road W, Odessa, TX, 79764
AVT Sealing Solutions Inc.	Addison IL	Addison - 1070 N Garfield Street Lombard, IL 60418
AESSEAL Sealing Products of Corpus Christie, LLP	Corpus Christi TX	Corpus Christi - 433 Sunbelt Drive, Suite A, Corpus Christi, TX 78408
AESSEAL Canada Inc	Toronto ON	#18 – 100 Westmore Drive, Etobicoke ON M9V 5C3, Canada
AESSEAL Canada Inc	Vancouver BC	British Columbia - #304 19292- 60th Avenue, Surrey, B.C Canada, V3S 3M2
AESSEAL (SEALTEC PLC SA)	Buenos Aires	Vicente Lopez, Buenos Aires - Sebastian Gaboto 4950, B1605BH-Munro, Buenos Aires, Argentina.
AESSEAL (SEALTEC PLC SA)	Montevideo	Montevideo - Asuncion 1476 Aguada , Montevideo
AESSEAL Brazil Ltda	Sao Paulo	Sau Paulo (Main Office) - Av. Guido Caloi No 1985, Galpao 3, Santo Amaro, CEP No. 0582-140, Sao Paulo SP
VULCAN ENGINEERING LIMITED (02422728)	Vulcan, NL	Simon Stevinstraat 25, 3284 WC, Zuid-beijerland, Netherlands
JaTech	Jatech, Mississauga	Home Office, Mississauga, Ontario, Canada
AESSEAL Colombia SA	Bogota	Bogota - Calle 25g No. 85B-65: Barrio Santa Cecilia de Modelia
AESSEAL Chile SA	Santiago	Providencia, Santiago. - Avenida El Retiro 1275. Bodega A05 RENCA- Santiago, Chile
AESSEAL MEXICO S. DE R.L. DE C.V.	Tampico	Tampico Tamaulipas - Carretera Tampico, Mante #2005 Local D Planta Alta y Baja , Colonia del Bosque, Tampico Tamaulipas CP 89318

AESSEAL MEXICO S. DE R.L. DE C.V.	Coaztacoalcos	Coaztacoalcos - Nuevo Leon No. 713 Colonia Petrolera, Coatzacoalcos, Veracruz, 96400
AESSEAL MEXICO S. DE R.L. DE C.V.	Atizapan	Gardenia 14, Tulipan y Azucena, HDA De La Luz, C.P. 52929, Atizapan De Zaragoza, Mex.
AESSEAL Coldweld Pvt. Ltd,	Coldweld	Vasai - BLDG.NO.4A, KT LASER,S.NO.15,H.NO.1, K.T.INDUSTRIA, VASAI PALGHAR Vasai
AESSEAL India Pvt. Ltd	Pune	Pune - Gat No. 85, At Post Varve, Khed Shivapur, Taluka Bhor, Dist. Pune, 412 205.
AESSEAL China Ltd	Ningbo	Ningbo - No. 65 1-2, Lane 777, Qingfeng Road, Ci Cheng Town, Jiang bei District, Ningbo, Zhejiang Province, China
AESSEAL China Ltd	Wuxi	Wuxi - 21F Coast Center, No. 41 Guanshundao Coast City, Taihu New Town, Binhu District, Wuxi City
AESSEAL China Ltd	Dalian	18th floor, Dalian Ping An Building, 24 Renmin Road, Zhongshan District, Dalian
AESSEAL China Ltd	Zhanjiang City	Room 806, No 9, Zone 4, Lucun Road, Xiashan district, Zhanjiang City
AESSEAL Pty Ltd	Johannesburg	Johannesburg - 67 Loper Avenue, Spartan Extension 2, Johannesburg, Gauteng
AESSEAL Pty Ltd	Durban	Durban Durban Belzona - 454 Kingsway Road, Amanzimtoti, KZN, South Africa
AESSEAL Pty Ltd	Cape Town	Cape Town - 10 Killarney Avenue, Killarney Gardens, Milnerton, Cape Town, 7441.
AESSEAL Pty Ltd	Richards Bay	Richards Bay - Unit 4, Dolphin Park, 72 Ceramic Curve, Alton, Richards Bay
AESSEAL Pty Ltd	Sasolburg	Sasolburg - 3 Oxygen Street, Sasolburg Eco Industrial Park, Vaalpark, 1947
AESSEAL Pty Ltd	Kuruman	10 Schoeman Street, Kuruman, Northern Cape, 8460
AESSEAL Pty Ltd	Secunda	Secunda - 14 Kingfisher Street, Secunda, Mpumalanga
AESSEAL Pty Ltd	East London	Mecedes Benz SA (PTY) LTD, 7 Settlers Way, Gately Industrial Township, Building B-Plant, Machine Shop, East London, 5200
AESSEAL Benelux BV	Breda (Benelux)	Breda - Nikkelstraat 27, 4823 AE, Breda.
AESSEAL Czech s.r.o.	Brno	Brno - Turanka 115, 627 00 Brno
AESSEAL Denmark A-S	Køge	Koege - Koebenhavnsvej 222, DK-4600 Koege
AESSEAL Austria GmbH	Oberösterreich	Obere Dorfstraße - Obere Dorfstraße 39, 4616 Weißkirchen an der Traun , Oberösterreich
AESSEAL Deutschland GmbH	Kronau	Kronau - Heidigstrasse 9, Kronau, D - 76709
AESSEAL Finland OY	Jyväskylä	Jyväskylä - Sorastajantie 1a lt. 2, 40340 Jyväskylä, Lansi-Suomen laani
AESSEAL France SARL	Nieppe	Nieppe - ZA De L'Epinette, 161 rue de Bruxelles, 59850 Nieppe France

AESSEAL Ibérica SL	Tarragona	Tarragona (Delivery Address) - Pol Ind Riu Clar, Plata 7, Tarragona, 43006
AESSEAL Italia SRL	Gallarate	Gallarate - Via Varese 17/B - 21013 Gallarate (Va)
AESSEAL Polska Sp. z o.o.	Mazancowice	Mazańcowice - Mazańcowice 999, 43-391 Mazańcowice
AESSEAL Nordic AB	Stockholm	Jordbro, Stockholm - Jordbro Park, Rörvägen 57, 136 50 Jordbro
AESSEAL Sızdırmazlık Tic.Ltd.	Istanbul	Istanbul - Tekstilkent Is Merkezi, A15 Blok, No.13 Esenler - Istanbul 34235
AESSEAL Univeda Unipessoal LDA	Gaia	AESSEAL Portugal LDA, Rua Centro Empresarial do Cavao, Pavilhão 04,4520-630 Santa Maria da Feira
AESSEAL WA	Kalgoorlie	15 Close Way, West Kalgoorlie WA 6430, Australia
Propack Dichtungen und Packungen AG	Sauerlach	Rudolf-Diesel-Ring 28, D 82054 Sauerlach
AESSEAL (M) Sdn Bhd	Selangor (Puchong)	Selangor (Puchong) - No.9, Jalan MJ 13, Taman Industri Meranti Jaya, 47120 Puchong, Selangor Darul Ehsan
AESSEAL (M) Sdn Bhd	Pahang (Kuantan - Gebeng Area)	Pahang (Kuantan - Gebeng Area) - A-25. Ground Floor, Jalan Gebeng 2/6, Kawasan Industri Gebeng, 26080 Kuantan, Pahang Darul Makmur, Pahang.
AESSEAL (M) Sdn Bhd	Johor (Masai)	Johor (Masai) - No. 31 Jalan Bukit 9 , Bandar Seri Alam , 81750 Masai, Johor.
AESSEAL (M) Sdn Bhd	Lahad Datu (East Malaysia)	Lahad Datu (East Malaysia) - MDLD 7635, Lot 3, Block B, Layung Industries, Jalan Tengah Nipah, 91100 Lahad Datu,
AESSEAL (M) Sdn Bhd	Pulau Pinang (Butterworth)	Pulau Pinang (Butterworth) - No. 52, Lengkok Kapal, Jalan Chain Ferry, 12100 Butterworth, Pulau Pinang
AESSEAL Saudi Arabia Co. Ltd.	Dammam	DAMMAM - DAMMAM 2ND INDUSTRIAL CITY - SAUDI INDUSTRIAL PROPERTY AUTHORIYT - MODON - Building No 6770 Unit No. 3 - PO BOX 6770 - 3341 Dammam 34334 KSA
AESSEAL Middle East FZE	Dubai	Dubai - Showroom No. S3B5SR08, Jebel Ali Free Zone, Jebel Ali, Dubai, UAE
AESSEAL Australia Pty Ltd	Brisbane QLD	QLD - 12 Counihan Road, Seventeen Mile Rocks, Queensland, 4073
AESSEAL Australia Pty Ltd	Rockingham WA	WA - Unit 6, 5 Nasmyth Road, Rockingham WA 6168
AESSEAL Australia Pty Ltd	Edwardstown SA	SA - 25 Weaver Street, Edwardstown SA 5039
AESSEAL COJ	Algiers	Algiers - Lot No 5 Zone d'activite Ain Benian-Alger, Algeria
AESSEAL Taiwan Co., Ltd	Kaohsiung	Kaohsiung City - No.124 Zhumen Ln., RenWu Dist., Kaohsiung City 81448, Taiwan (R.O.C.)
AESSEAL Namibia (Pty) Ltd	Swakopmund	Swakopmund - Unit 9, Einstein Business Park, Einstein Street, Swakopmund (moving Aug 19 to Winghoek)
AESSEAL Botswana (Pty) Ltd	Orapa	Orapa - Office Unit 3, Plot 1056, Industrial Site Orapa, Botswana

AESSEAL NSW Pty Ltd	Smeaton Grange (Stevco & AES&S)	11 Samantha Place Smeaton Grange, NSW, 2567
AES Edmonton	Edmonton	3104/3108 - 121 Avenue N.E, Edmonton, Alberta
Van Geffen AMS	Van Geffen	Uilenwaard 7, 5236 WB 's-Hertogenbosch, Netherlands
AESSEAL WA	Wangara	Unit 1, 41 Paramount Drive, 6065 Wangara , Western Australia
DATUM RMS	Fort Lauderdale	2040 Tigertail Blvd., Building 5, Suite E, Dania Beach, FL
AESSEAL Toroshima	Osaka	1-1-8 Miyadacho, 569-8660 Takatsuki , Osaka
Condition Monitoring Services (CMS)	Buffalo Drive, Las Vegas	No. 110 3291-B North Buffalo Drive, Las Vegas, Nevada
Condition Monitoring Services (CMS)	Cataluna Ct, Las Vegas	8810 Cataluna Ct, Las Vegas, Nevada